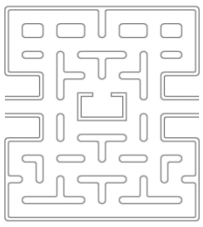

Complexity in Gaming

What Game Developers Need to Know

A Hypothetical Model for Comparing Player Motivation Relative to Complexity Preferences

by

Elizabeth Erin Lehtonen

Dear Friends and Family,

My thesis is complete, and I couldn't have done it without you all. I would like to send a big thank you to the following people:

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Yahoo!

Liz Lehtonen

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Abstract:

This thesis presents a hypothetical Model design for comparing and correlating player motivations with player preferences in computer games. In building this Model, multiple variables were investigated of which two were ultimately seen to have value and provide meaningful results. The first is a player motivation classification system originally created by Nick Yee. The second is a breakdown of complexity in games as developed specifically for use in this thesis. This final selection of key variables were then analyzed and correlated using the Model presented herein. Included in this work are a series of examples to demonstrate how and verify if the Model would work in practice.

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1 Introduction

Computer games are a constant means of entertainment for both the old and the young. It no longer is only the stereotypical teenage boys that play games, but instead a wide range of people, of both sexes, from ages three to ninety-three. However, there is still a large amount of people who don't play games at all. With this in mind, most game developers and publishers wish that they knew the secret formula to have in their computer games that would attract both new (loyal) fans and the untapped market of individuals who don't play games at all.

While an exact formula may never be found, more and more research has started to look into why human's play and what exactly is the attraction that people have to computer games. In 2005, the video game industry reported over $7 billion in sales (ESA, 2007). Any game developer would love to tap into this market, as even a small portion of it would provide enough revenue to fund their next game or even their next five games.

One of the possible means to consistently tap into this market could be accurate information on player types and their preferences. If a game company could have a quantitatively supported analysis of their projected player market they could know which portions of their new game to focus on and which portions to leave for extra time or money.

This thesis aims to present a theoretical framework to compare player types and their desires that will become the basis for future study. In order to do this, this thesis will be using a categorization of player motivations types by Stanford PhD Nick Yee to differentiate one player from another. In combination with the player motivation types, this thesis entitled *Complexity in Games: What Game Developers Need to Know* will be presenting a theoretical Model (herein the M is capitalized to signify this thesis' Model) that is intended to predict the affects of adding variables (complexity) on a games target audience. More specifically it will attempt to answer the question*: Is it possible to develop a Model of gaming that can reliably predict what game variables attract differently motivated players?* As well as the question: *What are the primary variables of the game and how are they linked to player motivations?*

After the framework for the Model of gaming has been presented, a small study will be held to analyze the possibility of future use of the Model. The test will be given to 50 participants and will be comprised of a combination of a motivations assessment and a questionnaire on complexity.

While the exact results should be looked at cautiously, this thesis hopes to create a solid theoretical framework for a Model of player-desired complexity in games.

1.1 Definition of Terms

Term	Definition
AI	Artificial Intelligence
Computer Game	A game made to be played using a personal computer
Console	A specific device for playing video games (Xbox360, Nintendo Wii, PS3, etc.)
Console Game	A game made to be played using a console
FPS	First Person Shooter
Guild	A common term used for an in game organization containing anything from dozens to hundreds of members.
MMORPG	Massively Multiplayer Online Role Playing Game
Newbie (Newb)	A newcomer to a game, or one that acts like a newcomer
NPC	Non Player Character
Personal Computer(PC)	A microcomputer designed for individual use, as by a person in an office or at home or school, for such applications as word processing, data management, financial analysis, or computer games. (Random House, 2006)
Player	A person who is playing a computer game, whether novice, intermediate or expert level.
PVP	Player vs. Player combat
Raid	A large gathering of players working together in a game to accomplish a certain goal such as defeating a foe or solving a puzzle.
RL	Real Life
RPG	Role Playing Game
RTS	Real Time Strategy
User Interface(UI)	A program that controls a display for the user (usually on a computer monitor) and that allows the user to interact with the system.
Voice over I.P. (VoIP)	The ability of voice to be routed over an IP network (such as the Internet).

Table 1: Definition of Terms

1.2 Purpose

The purpose of this thesis is to present and then evaluate a theoretical Model of gaming that will attract differently motivated players. This Model will attempt to present a system with which a game developer can discern the affects adding more variables have. The end goal is to provide groundwork for further study on adjusting game design to fit a certain audience.

1.3 Scope

For the sake of simplicity, the scope of this thesis will limit its research to those games that are played on the personal computer (herein noted as computer games). Some examples of computer games included in this research are *Tetris* (Puzzle) (Alexey Pajitnov, 1985), *Medieval Total War* (RTS) (Creative Assembly, 2002), *World of Warcraft* (MMORPG) (Blizzard Entertainment, 2004), and *Bioshock* (FPS/Adventure) (2k Australia/2k Boston, 2007). Therefore from this point on, when referring to games, this thesis will only be discussing those games that are playable on a PC.

In an attempt to provide a solid framework for the hypothetical Model, this thesis will be using existing literature and research, as well as interviews of professionals in the industry. There is very little literature available with information directly comparing complexity of games and the types of human motivations to play the games. Because of this, this thesis will be using, as a starting point, the more researched areas of motivation and player types in combination with a subjective complexity analysis, to create the input for the theoretical Model of gaming.

1.3.1 Game Familiarity and Skill Level

Treyarch, the game developer behind *Call of Duty 3*(2006), classified their potential future players into only three categories: those that have played their games, those that play games but haven't played their games and those that don't normally play games at all (McCord, 2007).

This categorization brings up an interesting point about player skill and familiarity level. Those people who have played Treyarch's games would be familiar with the computer game controls and general computer game environment. Those that play computer games but haven't played Treyarch's games would have a good general idea of what most games purpose is and be familiar with the input devices which would allow them to pick up another game faster and therefore have the will to do so, because it does not require that much output, and therefore be more enjoyable. Those that have never played computer games would be starting from ground zero and they would have no idea what they are doing. Those that have never played computer games before, are not familiar with the environment, may be overwhelmed by technology and aren't aware of the general rules of most games.

In turn, the level of a player's computer game familiarity can add or subtract from the amount of complexity the player would perceive in a game. For instance, a player playing a FPS (first person shooter) for the first time might find aiming the shooting device with the mouse awkward and have difficulty moving – their avatar might die a lot and in the end, the player would perceive the game as

annoyingly complicated, whereas someone who was familiar with FPS games would already have begun to think of the controls as second nature and therefore find the game more enjoyable and want to play it again.

The focus of this thesis, for simplicity, needs to remain on game playing motivation and it's relation to game complexity. Treyarch's classification system, regarding individual player skill level and computer game familiarity, is acknowledged, but the focus of this thesis remains on player game motivations and their preferences overall.

1.4 Motivation

The motivation for this thesis was stemmed in part by ten years experience playing computer games. My interest was furthered when I began to research the arena of player preferences and discovered the apparent lack of research in the area. I began to ask myself, and others, 'What actually motivates people to play computer games?' I also have personally felt frustrated by certain games compared to my husband's apparent enjoyment of the same games. The thesis question was initialized during a few successive evenings of playing first *Medieval Total War* (*MTW*) and then *World of Warcraft*; and my subsequent lack of motivation to continue playing, while my husband wanted to keep playing.

MTW is a real time strategy game (RTS) in which the player's role is a ruler of a country. During the *MTW* evenings I found myself annoyed at the complex UI and then even more agitated at the insistence of the game on personal handling of any wars. I prefer to spend my time tinkering with the towns and people rather than directing vast armies or attempting to balance an economy. A few turns after an extremely drawn out series of wars that resulted in me thinking that I had finally conquered France, I found that I had not actually conquered all of France. Indeed, a rebel army led by a son of the former French monarch had somehow managed to gather thousands of supporters and was fighting back. After a few failed attempts at demolishing him, along with losing most of my land, I gave up out of pure annoyance. However, to my dismay, my husband who was simultaneously playing the same game was intent on conquering his entire world, which he did, three days later.

My second experience was in *World of Warcraft,* which is a MMORPG or persistent world. A few evenings after the first experience, I found myself in a raid in *World of Warcraft* and was becoming increasingly overwhelmed with the amount of information I had to pay attention to on my screen. Recently, in *World of Warcraft*, an increased amount of modifications had been created to affect the UI. My guild required that I had many of these different modifications. But, as I added more and more

modification to the initial game I found myself thinking of the game more as work than play. Yet next to me, my husband had a screen covered with information, literally 30 or more modifications, and he found obvious delight in tinkering them every which way. He was also finding a large amount of enjoyment in the vast amount of information he learned each time the raid died to a monster and came back to try again.

After spending many frustrating evenings playing games that I was enjoying less and less I believed that there had to be a reason I was attracted to different variables then my husband. With this in mind I spent several evenings questioning friends on their playing habits, likes and dislikes. As expected I found that everyone had their own views on each game, but I also started to notice some similarities between the players. For instance, some of my friends who loved to PVP (Player vs. Player) and loved competition had no desire to play games that required them to think before acting. My friends found these games in their own words, "Increasingly long and boring." (B., 2007)

1.5 Structure

This thesis is split into three distinct sections. The first section will present previously researched information with some subjective analysis and is covered in chapters two and three. The second section proposes the theoretical Model of gaming, explains the mechanics behind it, and introduces a study (it will be covered in chapter four). The last section, chapter 5, is a combination of two things: an analysis of the study's results, and then two examples that use the data from the study within the theoretical Model. The last chapter, Chapter 6, will draw together conclusions, give self-critique and thoughts on future research.

Chapter 1: This chapter is the introduction of the thesis. It will be introducing the specific areas this thesis will cover and those it will not. It will also explain the motivations and framework behind this thesis.

Chapter 2: This chapter will introduce a model of player distinction called 'motivational types' (Yee, 2005c). This model was deduced after multiple years of study on online games by a PhD from Stanford University, Nick Yee. While this model was specifically presented as a model for MMO's this thesis will argue that it *can* be applied to help differentiate gamers of all types of games.

Chapter 3: This chapter will be introducing the different types of complexity in games. In an attempt to keep this thesis as focused as possible only three major areas of game-play complexity with 18 sub-types

were chosen. While this number is limited, the goal of this thesis is not to dispute what is complex about games, but rather to focus on the possibility of a Model to predict player-desired complexity and analyze it. The three main types of complexity covered in this thesis are: game play, interaction and setup.

Chapter 4: This chapter will introduce the theoretical Model of complexity and explain the mechanics that could be used to fill it. This chapter will also introduce a small study and explain how the two angles of it, motivations and complexity, will be sought.

Chapter 5: In this chapter, the results of the study introduced in chapter 4 will be analyzed. This chapter will also include two examples that use the data found in the study within the proposed Model to show how it would work.

Chapter 6: This chapter will draw together conclusions, give self critique, layout the possibilities for future research, and add some final thoughts.

2 Understanding the Player

When one thinks of humans, one can visualize billions of completely different shapes, colors and personalities. However, while every human is unique, there is always a series of ideas, traits, or actions that we can use to identify similarities within the population. Not everyone plays computer games, but they still have the same ideas, traits, or actions as those who do play computer games. People play games for a variety of reasons.

What do people consider fun? Why do people play? Simply due to the potential money involved in this industry, these questions have been researched over and over. It's logical that every game company would like to know the answer, and if they indeed knew the answer, they would all be successful. But this is not the case. In fact, it would be a fair speculation that every single major game company has a different scale for categorizing their players and some are better than others.

Therefore, to create a Model of complexity in games one first needs to understand the people who play games. There have been a number of research studies looking at player classification. To get a better idea of how studies have evolved on this issue a timeline of research will be presented starting from Bartle and ending with Nick Yee. This timeline will give an understanding of the pros and cons of the various studies into player use and explain why Nick Yee's framework for categorization was chosen for this thesis.

2.1 Background & Research

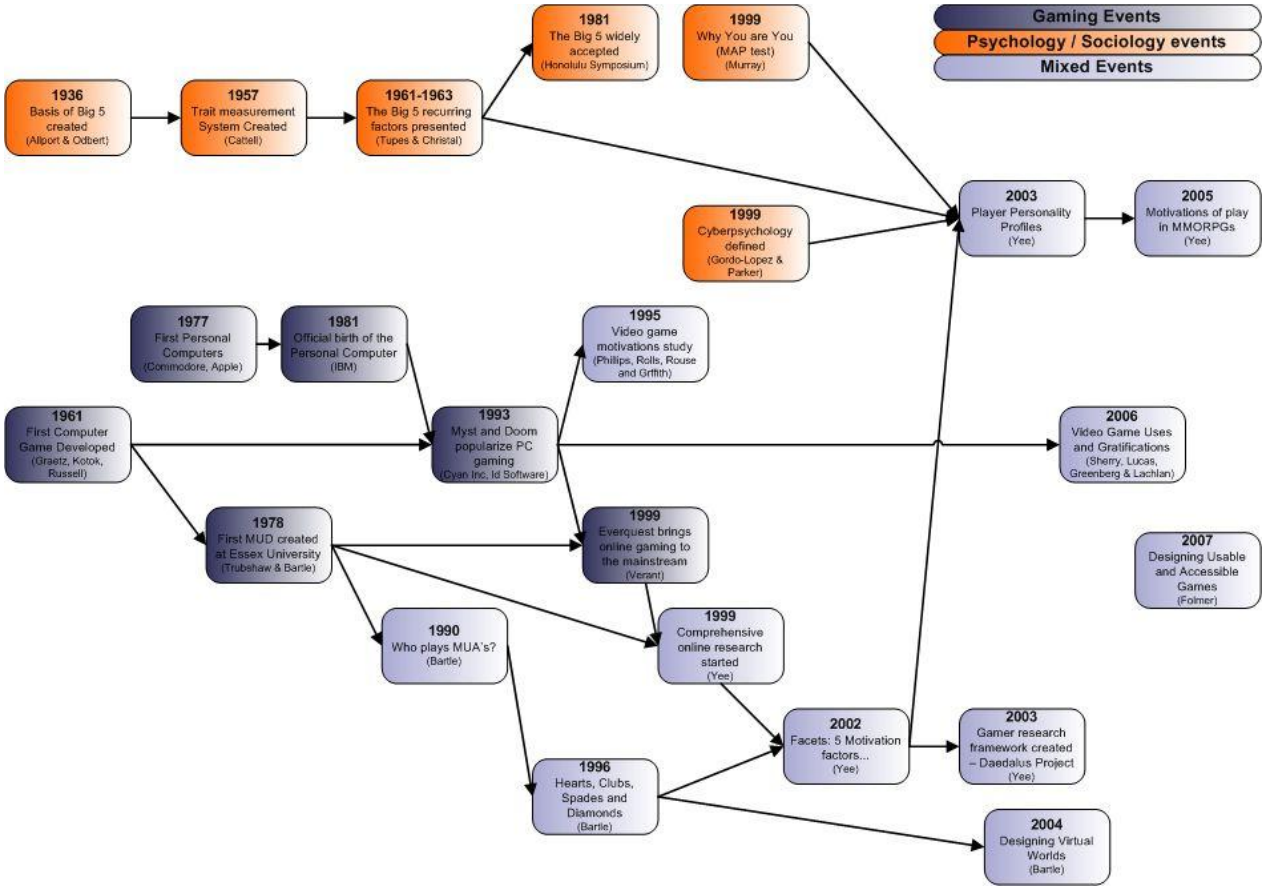


Figure 1: A timeline of player research

2.1.1 Bartle - Player Types

Richard A. Bartle created one of the original and most well known player classification types via his studies of online game dungeons or MUDs (Multi-User Dungeons). In 1990 Bartle wrote a paper entitled *Who plays MUA's?*[1] In this paper he proposed four different player types: killers, achievers, explorers and socializers. He then placed these four types onto a graph which could be used to interpret how each type would best be entertained (Bartle R. , 1990). This paper was the starting point for his well known paper, *Hearts, Clubs, Diamonds, Spades: Players Who Suit Muds* in 1996.

In *Hearts, Clubs, Diamonds, Spades,* (1996) Bartle expanded upon his definitions of the four player types and gave an in depth analysis of how he thought the four types would interact. Bartle believed that while there was some crossing between the motivations, most people had only one main motivation.

[1] MUA stands for Multi-User Adventure and is often used interchangeably with MUD or Multi-User Dungeon (Bartle, 1999)

While this stipulation really simplified player separation; it unfortunately also limited the ability to truly understand the difference between players.

In his 2004 book, *Designing Virtual Worlds,* Bartle re-assessed his player classification types and added four more types. He also suggests the possibility of a player type progression. This progression follows that of a player from a 'newbie' to a retired player.

He suggests that:

> Many newbies will first want to ascertain the established norms of behavior (which can involve killer-style behavior) … Having gained the necessary skills and knowledge, they can start to play "properly" as an achiever. Months later, when they have reached the top, they retire into the life of a socializer. This is the killer to explorer to achiever to socialize path... (Bartle, 2004).

This path is just one of a few suggested pathways of player progression. This flow suggests that rather than players being a variety of types at the same time, they instead change types as they encounter stages of their gaming life.

Even with his further thoughts on player types and their progression Bartle still finds that players are usually limited to one player type. Because of the limitations of forcing a player into a small singular classification box, the lack of empirical support and the absence of an official assessment tool, Bartle's types were rejected as a possible player classification for this thesis.

2.1.2 Phillips, Rolls, Rouse and Griffith - Why do we play?

According to a study conducted by Phillips, Rolls, Rouse and Griffiths video game playing motivation included: "to pass time", "to avoid doing other things"," to cheer oneself up" and "'just for enjoyment"' (1995 cited Sherry *et al.*, 2006). There have also been other studies into gratification from video games which found other uses from gratification including arousal, social rewards, skill testing, displacement, and stress reduction (Griffiths, 1991a). These studies were part of a more mainstream group that began to find interest in player motivations besides that of the relatively common motivation derived from addiction claims.

2.1.3 Greenberg, Lachlan, Lucas and Sherry – Video Game Gratification

Two in depth studies on video game gratification were done by Greenberg, Lachlan, Lucas and Sherry (2006). The first study was intended to "develop a set of theoretical traits for video game uses and gratifications." The second study was done to "examine age and sex patterns amount the set of system

traits (found in the first study)..." These studies gathered their information from survey's given to fifth grade, eighth grade, eleventh grade and college students. (Greenberg *et al.,* 2006)

The first study found six dominant gratifications gained from playing video games: Arousal, Challenge, Competition, Diversion, Fantasy, and Social Interaction.

These 6 uses were then represented in a 20-item scale of uses and gratifications in games:

> Among all respondents, the top reason on a scale from 1 to 7 for playing video games was Challenge, followed by Competition, Diversion, Arousal, Fantasy and finally Social Interaction…Among college students, 28% of the variance in game play was accounted for by uses and gratifications, with diversion, social interaction, and arousal as the most important predictors of time spent playing video games per hour. The pattern was the same among 11th graders, with more variance explained using the same variables Diversion, Social Interaction and Arousal. (Greenberg *et al.,* 2006).

These studies very neatly identified the different gratifications into separate categories but did little to define each player within those categories. This makes it difficult to use as a framework for classification and it was therefore rejected.

2.1.4 Folmer, Yee, Pugulayan – Game Interactivity

"What separates games from other forms of entertainment is that they provide interaction…" (Folmer, 2007).

One possible means of classifying players could be through the amount of interaction they desire within games. Some games, such as *The Sims* (Maxis, 2000), have a lower level of interaction, meaning when you change something the reaction of the NPC's is not always immediately apparent. Whereas a game like *Half-Life* (Sierra, 1998) has a high level of interaction. If you push something it responds immediately with sounds, movement, and consequences. So inherently it would be possible to identify those that like immediate interaction and feedback and those that like interaction over time.

According to Pagulayan:

> The goal of design, usability, and technology are to remove unnecessary constraints because they stand between the user and the result to be obtained, or at least to minimize externally

imposed constraints that arise from the interaction between user goals and the environment. (2003)

Unfortunately, while interactivity itself has been studied there has been very little research involving the use of interactivity as a means of typing players.

2.1.5 Nick Yee - Motivation of Gaming

Nick Yee is a recently graduated doctoral student from the communications department at Stanford University. Two of his main areas of research have been online games and immersive virtual reality. His interest into research on online games started in 1999 and then began in earnest in 2000 with an independent study into immersive online environments under the tutelage of Prof. Doug Davis. To supplement his ongoing research, he started a project called Daedalus in 2003. Yee's intent with the Daedalus Project was to create a framework for all the research he had done and would do, on online gaming worlds.

Yee believes that his research has flourished and has had strong support from the gaming community because he does not focus on problems within the community. Rather his interest has been focused on an in depth study into the motivations, demographics and experiences of users in MMORPGs. Of particular interest to this thesis is a research and analysis called *Motivations of Play in MMORPGs: Results from a Factor Analytical Approach* (Yee, 2005c). This analysis identified 3 main components of motivations of gaming with 10 sub components.

Yee's research has come to the forefront as the most viable means of typing players due to the following:

1. It allows that each person can have a multitude of different motivations for playing games. This means that there will be no restrictive forcing a player to be only one type of person (therefore meaning everyone can be different).
2. It has the initial poll readily available as well as a visible diagnostic of the poll-takers motivation types.
3. He has devised a way to assign a player a primary motivation if there is a necessity for such. He admits though that the primary motivation is "a somewhat lax criteria but serves the purpose of providing an easier interpretation of the data" (Yee, 2005d).
4. The sheer amount of responses to his research polls (40000+) is far above that of his peers and the relative accuracy has been confirmed with comparisons to statistics from MMO subscription information. (Yee, 2005c)

Nick Yee's research at Stanford University will provide a toolbox for development of this thesis. He has developed a quick, yet statistically viable way to assign a player a series of motivations that can then be compared to a scale of complexity that will be introduced further on in this thesis.

2.2 Tools for this Thesis

To start this research Yee put together a list of possible player motivations that were gathered from existing research, such as Bartle's, and massive amounts of qualitative and quantitative data he gathered himself. He then took these motivations and put them into the form of a 39 question poll (Appendix A). The initial poll was taken by 3200 people. He used a factor analysis to ensure three goals:

1. "Ensure that components of each motivation are indeed related
2. Ensured that different motivations are indeed different
3. Provided a way to assess these motivations (Yee, 2005c)."

After a number of iterations he has been able to differentiate three main components of motivation of gaming with 10 total sub components. Yee's three main components are Achievement, Social and Immersion. The 10 sub components are Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-playing, Customization, and Escapism.

Achievement	Social	Immersion
Advancement **Progress, Power, Accumulation, Status**	Socializing **Casual Chat, Helping Others, Making Friends**	Discovery **Exploration, Lore, Finding Hidden Things**
Mechanics **Numbers, Optimization, Templating, Analysis**	Relationship **Personal, Self-Disclosure Find and Give Support**	Role-Playing **Story Line, Character History, Roles, Fantasy**
Competition **Challenging Others, Provocation, Domination**	Teamwork **Collaboration, Groups, Group Achievements**	Customization **Appearances, Accessories, Style, Color Schemes**
		Escapism **Relax, Escape from Real Life, Avoid Real Life Problems**

Table 2: 'Components and Subcomponents' (Yee, 2005c)

2.2.1 Achievement

The people who play for Achievement are those seeking to push the boundaries of the game. They are the most likely to be topping high score lists, leading guilds or clans, and analyzing game information to maximize their characters. The Advancement sub-component consists of people who are most interested in pushing the boundaries of the game. They are the guild, clan and discussion leaders. They will be looking for items in a game that give them higher status then other players (and thus be recognized that they are higher status by other players and NPCs). These players are most likely to be

found in hard-core guilds. Mechanics players are those who crunch numbers to seek the most ideal combination for their characters. They are those who will spend hours shifting through websites, work sheets and modifications to be the most efficient player in a game. Competition players are those who gain satisfaction in beating or dominating their fellow players. They will do this via group (raids), player vs. player, or political manipulation. (Yee, 2005c)

2.2.2 Social

Social players are those who play to chat with others, gossip, or find happiness in success as a group. These players can find themselves doing the same activities as Advancement types but for completely different reasons, i.e., being part of a discussion group to help the community rather than one self. The Socializing players spend a good portion of their time chatting and helping friends. Relationship players are similar to Socializing players but spend more time talking with those they have formed meaningful relationships with. They will often exchange personal information and problems with close friends. Teamwork players find themselves spending time for the betterment of the group. They will usually be found working in a group rather than soloing. This includes assimilating new members, passing along information, and preparing for future group activity. (Yee, 2005c)

2.2.3 Immersion

The Immersion group is the last group of players. The players play to try out things they wouldn't be able to do in real-life. The Discovery sub-component is interested in finding all the nooks and crannies of the game. They will want to find any secret 'cool' things hidden in the game as well as check out every area. The Role-playing group is composed of players interested in pressing the boundaries of fiction. They transform their characters to fit a desired role, create a history for them, and fit them into the story of the world. The Customization group likes to maximize their characters chosen look. They will choose items for their character via looks or because it's a matching set rather than for stats. These are the group who can spend hours in character setup to get just the right look. Escapism players use the game world to escape from something in real life or just want time away. (Yee, 2005c)

2.3 Motivation Assessment Results Example

After taking the motivation assessment test a player is given information that allows them to digest the given information. First Yee includes an overview of the test and a section to help the test taker interpret their scores. There Yee notes that the most interesting scores are the very high and very low

ones because, “it is those that reveal the preferences and dislikes of a gamer.” (Yee, 2005a) He also found that average scores, between 40%-60%, aren’t very interesting.

Each test taker is then given a percentage break down for the 10 subcomponents and a graph to represent each of the 3 main components. Each percentage is preceded by a short explanation of what it means to be a “high” score in that subcomponent. Of course, it is also important to understand that someone with a “low” score in a subcomponent finds the opposite of that subcomponent the most interesting.

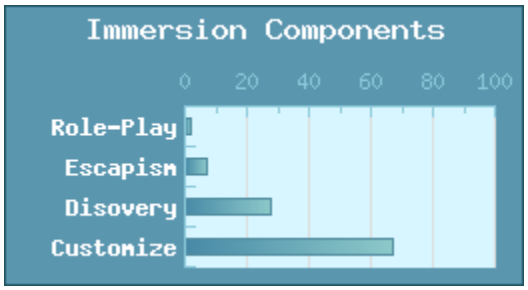


Figure 2: A graph depicting scores in the Immersion Main Component (Yee, 2005a)

For example, someone who scores high in the Advancement sub-component “derives satisfaction from reaching goals, leveling quickly and accumulating in-game resources such as gold.” (Yee, 2005a) Therefore, someone who scores low would be more interested in taking their time to level or reach goals and aren’t particularly interested in accumulating in-game resources.

Finally, Yee provides a graph to depict the overall assessment of player’s motivations. He does warn though that this graph only shows the main motivations and therefore may not be totally accurate if someone had a large difference in one of their components subcomponents.

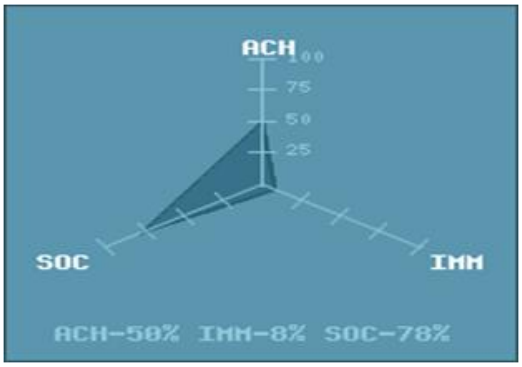


Figure 3: An example a players overall assessment graph (Yee, 2005a)

2.4 Research Viability outside MMORPG's

While Yee's motivation types were done as research primarily for MMORPGs, it seems viable that his categorization could apply to other games. There have been other studies, such as one done by Ermi and Mäyrä (2005) on immersion, which have found similar results to Yee's. From their research they present a game play experience model (SCI) which "identifies the three key dimensions of immersion that are related to several other fundamental components, which have a role in the formation of the game play experience." (Ermi and Mäyrä, 2005). Their model exhibits both game and player components with motivation listed among the 5 player components. They also note that, "game play is represented as interaction between a particular kind of a game and a particular kind of a game player." (Ermi and Mäyrä, 2005).

In another portion of their research a number of interviews were held with children who play games to see how they perceive game immersion. They noted seventeen "Elements related to pleasurable gameplay experiences…" (Ermi & Mäyrä, 2005); some of notes are: advancement, combat, winning, controlling, exploration, characters and world. These elements are extremely similar to those found by Yee and therefore assist in linking Yee's work to that of players of non MMO games.

3 Complexity

Technological advances in personal computers have allowed computer games to grow more and more complex. This has allowed game developers to find new, more advanced ways to make their customers experience fun. Story lines can be extended, non-player characters (NPC) can be given diverse, interactive personalities and game worlds can become vast.

As noted in the mentioned examples above, complexity has several clearly distinct facets. An open-ended game with romantic interest NPCs with incredible AI is certainly very complex, but not necessarily what the complexity loving strategy gamer used to moving hundreds of divisions and squadrons would have in mind when he says he loves complex games. For this reason this thesis splits game complexity into different types. There will be three primary categories: Interaction, Game Play and Setup with eighteen sub categories. Of course game complexity could be split other ways as well, but this split has been used as the basis for this thesis.

Complexity is not only positive though, the ability to make a game complex can make a game developer forget who they are making the game for. Naturally game playing is a subjective experience. Therefore, it is important to know what the game's target audience is and what their preferences are. Will that adventure-loving mother really care if she has 50 modifiable weapons available?

Subconsciously game developers have always been aware of this; no one spent hours creating a romantic plot in *Doom* (ID Software, 1993) or twenty game types in *Tetris*. Why not? Because: the target audience would not have really cared about increased complexity in these areas.

Complexity choices effectively affect several things, primarily time-to-market/developer effort and the previously mentioned way different groups will enjoy the game. To give an example, let's see the (theoretical) effects of a caricature.

A company decides to create an animated "colonel" NPC for a strategy game, with whom the player could become intimately involved.

Category	Result
Developer Effort	~500h of effort, costing roughly $50,000
Time-to-market	Game was 1 month later than expected
Gamers that didn't like	Most of the target audience gamers found the whole thing somewhat appalling and the feature became a laughing point about the game. Eventually the whole game got remembered for it.
Gamers that didn't care	The ones that didn't mock didn't care.

Gamers that did like	None of the gamers that would have liked were about to buy a complex strategy game anyway, so no positive effect manifested.

Table 3: Example of Complexity Adjustment

Of course the message between the lines here is that if you do not understand who plays your games, understanding your complexity is fairly meaningless.

3.1 Usability and Complexity

When talking about complexity of games, one cannot skip usability. Complexity of the User Interface and complexity of the game are tied to each other, which is why this chapter tries to explain how the thesis looks at this problem.

Usability can be considered a factorial on complexity, though the issue is more complicated than that.

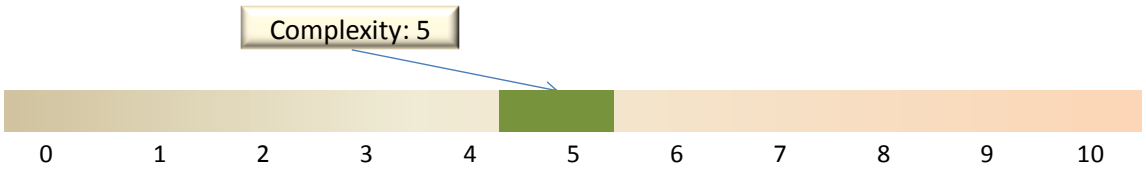


Figure 4: Game Example in Usability

The above image visualizes a theoretical scale of complexity from 0 to 10. On it is a game with a certain complexity (5). The following image show what sort of effect on that usability can have.

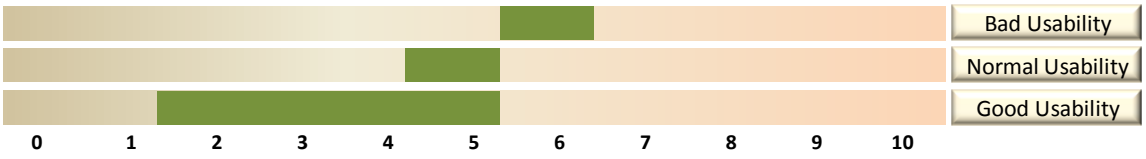


Figure 5: Usability's Effect on Perceived Complexity

Bad usability actually makes the game appear more complex than it is. While this might seem like a good idea if the target audience likes this type of complexity, the gamers will almost certainly see through it.

Normal usability doesn't really do anything except relay what was already known, which means that for all intents and purposes, the game has no usability.

Good usability actually widens the spectrum. The full complexity is available for players who are advanced enough to enjoy it, but it is by no means mandatory. This is incredibly valuable, as a wider range of players can be attracted to the game. However, usability is not within the scope of this thesis, and therefore it will not be touched on more than this.

It is, however, important to understand that many people writing in this field have not truly made the difference clear. This means that their writings quite often talk about both the complexity of the game and the perceived complexity of it in the same sentences. While this is understandable, computer gaming is hardly an old field of study , it also makes many references useless, since the whole idea is to define what complexity means as opposed to usability.

3.2 Supporting History and Research

Unfortunately, it was not possible to find a means to define the distinct areas of game complexity that was steeped in large amounts of research such as was done for the target audience and player motivations assessment. Instead a subjective analysis was compiled based upon insight found from articles, papers, and studies on complexity as well as the author's personal observations.

The following information is important because, it was the starting point from which the complexity variables were derived. It is important to note that many of the following papers and research are heavily steeped in usability without clarifying it. Regardless, the most important thing to gather from these is that they gave a stepping point from which to go forward.

3.2.1 Freeman - Emotioneering

Freeman's (2003) work is a compilation of techniques to create for 'emotioneering', i.e. something that draws the player more emotionally into the game. He split his work into 34 categories that cover the interaction of NPC-NPC, NPC-player, plot, environment, story, game play, and a few others. The most important concept taken from his work is that it is possible to make a game more emotionally complex by just adding or paying more detail to a few things. However, only his work that affects game play is relevant to complexity, so those parts of his work that do affect game play were used as a stepping stone for the interaction complexity category.

Of note are his technique suggestions for the social interactions of the NPCs to each other and the player. His ideas include: giving each NPC a few distinctive emotionally penetrating traits, make single lines of dialogue have traits, each group, platoon, and village is given a distinctive characteristic, chemistry between NPC s or towards the player, character-arcs for NPC s, emotionally complex relationships between player and NPC, and group bonding techniques. (Freeman, 2003)

Of course, even this long list only scratches the surface of his work. However, it is important to understand his general idea that 'emotioneering' can make a game much deeper and complex if done

correctly. His work makes a strong case for NPC and player interaction as an important aspect of game complexity.

3.2.2 Lopez – Mechanics Progression

Lopez (2006) gives a nice look into the ways that game-play and the user interface can be made manageable for the player. He uses the term mechanics to imply all controls, skills, moves, weapons, etc. that are available throughout the progression of the game. He considered there to be two main styles of progression for mechanics:

1. **Gated Access** – make some mechanics unavailable initially until a later point in the game.
2. **Directed Game play** – make all mechanics available up front but direct the game play (missions or levels) to utilize mechanics progressively (so the first levels only **require** the basics and each level or stage layers on something new).(Lopez, 2006)

3.2.3 Time Complexity

Since the early 1990s complexity has started entering more regularly into the scientific field e.g. computational complexity theory and computational sociology (Wikipedia, 2007b). These scientists have been specifically interested in complexity as defined by those things that display variation without being random.

Time Complexity of something "is the number of steps that it takes to solve an instance of the problem as a function of the size of the input, using the most efficient algorithm." (Wikipedia, 2007c)

This idea about complexity proposes the idea that complexity can be measured by the number of steps it takes to reach a goal. The direct algorithm was impossible to apply, as every single step would need to be known about every portion of a game to even get close to an attempt to create a problem out of this. However, what it does give is the idea of amounts being a viable way to measure complexity. This is something we will see more of in all areas of complexity presented here.

3.3 Types of Complexity

The complexity types will be split into three different areas. These areas are intended to cover the three most common areas of player interaction with the game. These are Game Play, Interaction, and Setup. These terms are an arbitrary choice, but they allow for a clean split with usability. Arguably some of these areas could be interchanged with others, but the goal is to study a theoretical Model of how complexity and motivations interact not argue the complexity areas of a game.

3.3.1 Measurement of Complexity

Each of the three areas of game complexity has their own series of variables. These variables are then measured as low, medium, or high complexity. While a more complex system of measurement might be better, as the actual Model is capable of handing significantly more complex data, in the scope of this thesis *low*, *medium*, or *high* will suffice.

It is important to note; within this thesis the complexity types are presented as equal. However, the phrase "game play is king" (Sony Ericsson, 2004) is repeated often enough that it should be taken into account that game play often has a bigger effect on player happiness.

3.3.2 Game Play

Game play is the largest area of complexity for this thesis and therefore has the most impact. It includes just about everything that happens in the game that is not setup or interaction. This means the flow of the game, the time frame, the story elements, the actions required to complete the game and the uses of the avatar. However, these are all lumped into one because they are specifically the design that is meant to be played, i.e. what the player is actually intended to enjoy when he plays the game.

Game play complexity has been split into 7 variables under 4 main types: game size, entity complexity, user interface (UI), and artificial intelligence (AI).

Type	Sub-Type
Game size	Width
	Number of Endings
Entity Complexity	Amount of Controlled Entities
	Ability to effect Entities
	Actions per Entity
Artificial Intelligence (AI)	Opponent AI
UI	User Interface

Table 4: Game Play Complexity Variables

3.3.2.1 Game Size

The game size variables are directly related to how *big* the game is. This main complexity here is how many choices the player has once he has entered the game. Examples being games that are linear such as *Half-Life 2* (Valve Corporation, 2004) or games with a world that is completely open, like *Elder Scrolls IV: Oblivion* (Bethesda Game Studios, 2006), with hundreds of choices to make before reaching the ending (if the player even chooses to reach it).

Width

The width of the game implies how many routes it is possible to take, or if there is even a route at all. Great examples of very wide games are *The Sims*, MMORPGs, and *Fallout* (Black Isle Studios, 1997). These are the types of games where a player can spend hours working up a faction to buy a house or get a trinket that doesn't effect at all how they finish the game. The other end of the spectrum contains completely linear game play such as *Half Life 2* or *Doom*.

Half Life 2
In *Half Life 2* the player has no choice but to continue forward along his given route. It doesn't however detract from the game play, as instead of focusing on width the developer choice to focus on game play and style.

Complexity: Low

Star Wars Galaxies (Sony Online Entertainment, 2003)
In this game players can choose from nine extremely different classes. These range from an Entertainer to a Smuggler to an Officer. But this is just the stepping stone. Upon entering the game, each player will follow an extremely different route to level up and gain skills.

Complexity: High

Figure 6: Width Examples – Half *Life 2*(Top), *StarWars Galaxies* (Bottom)

Number of Endings

The ending variable covers the amount of endings possible to win a game. One important difference with the ending variable is that for games with an *actual* developer defined end point the level is maxed at medium, and only open-ended games can be high. To note: the amount of ways to start is *not* included here, because this is usually adjusted in Setup Complexity.

***Star Wars: Knights of the Old Republic* (*KOTOR*)** (Bioware, 2003)
KOTOR has two possible endings to the game. The player either sees a dark side or light side video (e.g. see Game-Endings, 2007), based off the choices they made in the game, as their ending.
Complexity: Low

Everquest (Verant Interactive, 1999)
This game has no developer set ending, therefore each player chooses what he considers his ending. Only one of many such endings was a player who had a goal of becoming the richest person on the server once he had attained this, he quit.
Complexity: High

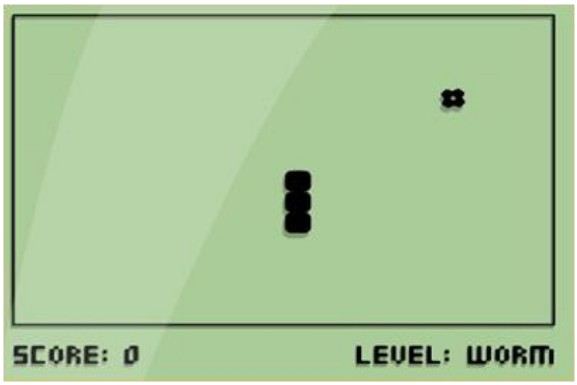
Figure 7: Ending Amount Examples - *KOTOR* (top), *Everquest* (bottom)

3.3.2.2 Entity Complexity

An entity refers to *anything* that can be controlled in a game, be it blocks falling from the top of the screen (*Tetris*), a Jedi running through storm troopers (*KOTOR*), the city of Rome building the Colossus (*Civilization 4*) (Firaxis Games, 2005) or an army preparing for an attack (*Medieval Total War*).

Amount of Controlled Entities

This variable includes the amount of entities it is possible for the player to control. In games such as *Quake 4* (ID Software,Raven Software, 2005), the player only controls one entity, himself. In games, such as *Gary Grigsby's Pacific War* (Grigsby, 1992), the player is controlling a huge load of entities: merchant marines, shipyards, ships, flight squadrons, and infantry. This variable seems to be the scariest as it is the most visible and immediate of the variables.



Snake (Seger, J.,1979)
In the classic game of *Snake*, the player is only controlling the head of the snake (himself) and has no control over anything else.
Complexity: Low

Medieval Total War 2 (Cyberlore Studios, 2006)
This game has two main areas: within a battle and without. Within a battle a player is controlling a large amount of units, each one an entity. From without, the player must control his armies, towns, spies, royal family, etc.
Complexity: High

Figure 8: Entity Amount Examples - *Snake* (top), *Medieval Total War 2* (bottom)

Ability to Effect Entity

This area dictates how much a player can affect each of his entities. This includes filling health, armor or mana, happiness levels, and upgrades. On the more complex end it might include choosing to make your character a peaceful trader rather than a bloodied fighter.

Half Life 2
In *Half Life 2* the player can gain health and armor as well as find new weapons throughout the game.

Complexity: Low

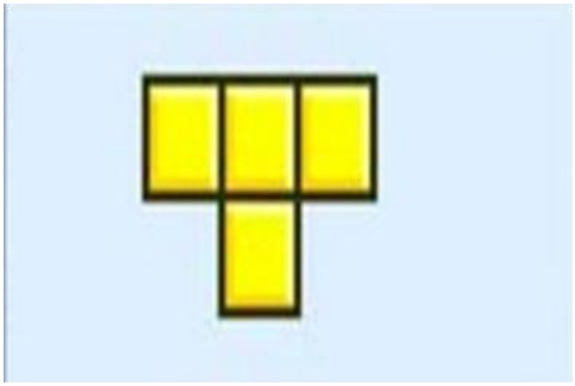
Black and White (Lionhead Studios, 2001)
In *Black and White* the player is in the position of a God. They are able to extensively train an avatar as well as directly affect the lives of the people in the game.

Complexity: High

Figure 9: Entity Effects Examples - *Half Life 2* (top), *Black and White* (bottom)

Actions per Entity

This includes how many actions each of the player's entities can do. This means, for example, movement, skill capabilities and actions. In the game *Snake*, players can only do 4 actions: move all four directions. In a more complex game, like *Baldur's Gate* (Bioware, 1998), entities can use numerous skills and spells. Or in a different complex alternative like *Civilization 4*, some the entities (cities) can choose between literally hundreds of options.



Tetris
Tetris pieces can be moved left or right (and in later versions down) and rotated either clockwise or counterclockwise.

Complexity: Low

Elder Scrolls IV: Oblivion
Players in *Oblivion* have access to 100+ spells and 20+ skills. They can sneak, crouch, jump and run. The combination is a huge amount of capabilities no matter what type of character the player makes.

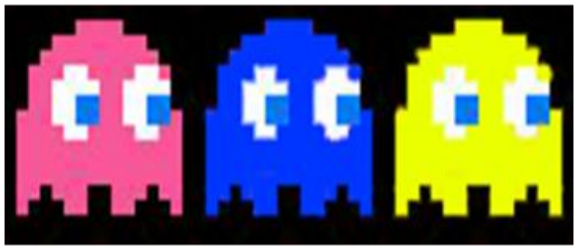
Complexity: High

Figure 10: Entity Actions Examples - *Tetris* (top), *Elder Scrolls IV:Oblivion* (bottom)

3.3.2.3 Artificial Intelligence (AI) Complexity

Opponent AI[2]

The complexity of the opponent AI is directly related to the actions and reactions that the computer controlled hostile entity, often called Mob, can perform. At the most simple levels the AI stays competitive by being random or having simple directions, which means the player doesn't have to worry too much about what the AI actions are only avoid it. In the middle, the player can out think the computer without excessive effort. The most complex AIs are usually quite clever and will definitely give players a run for their money.



Pacman (Nameo, 1980s)
The ghosts of *Pacman* each seem to have a different behavior. One seems to track Pacman, one to be fast but random, one starts shy, and one is slower and random.(Mateas, 2003) The combination is a simple but effective AI.
Complexity: Low

Bioshock
The splicers of *Bioshock* have a variety of attacks and can change their routes according to player location. They can taunt, flee, heal, search, brag, dodge and react to player actions. They represent a very adaptive AI.

Complexity: High

Figure 11: Hostile NPC AI Examples - *Pacman* (top), *Bioshock* (bottom)

3.3.2.4 User Interface

The User Interface was excluded as a primary type of complexity because, after much research, it was found that a large portion of it slides too deeply into usability issues. It is such, that while it is very possible to have a very complex UI, it is most often that only poor usability makes it actually unplayable.

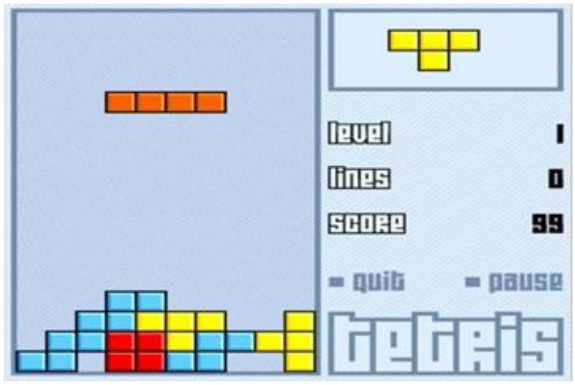
However, it must be noted, that some games, such as *Silent Hill 3* (Konami Computer Entertainment, 2003), integrate the UI as a type of game-play complexity. Games like this make the UI complex as a

[2] The perceived complexity from opponent AI can be affected by player skill level, but as noted in chapter 1.3.1 it is outside of the scope of this thesis.

design choice thus it argued for inclusion of the UI as a variable of game play complexity because it is used as a means to make the game more complex and deep.

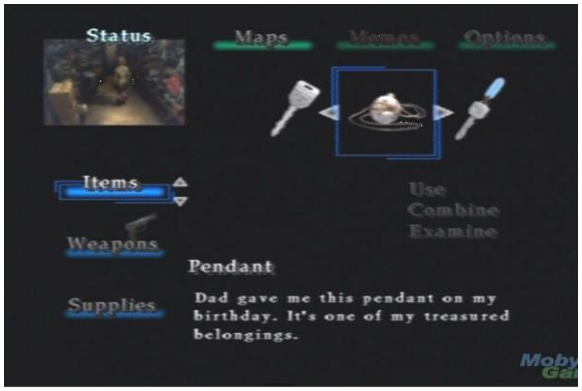
Therefore, the User Interface will be defined as the information a player immediately sees upon entering the actual game as well as the menus used to gain access to the things immediately useable by the player. These include menus such as the paper doll, macros, emotes and hotkeys. These are the menus that users will interact with commonly every time they play the game.

Complexity with the User Interface is found in the amount of possible variables the player can use as well as the way in which these variables are released across the game. Whether the game designer uses gated access, directed game play, or some other means of presenting UI components to the player, all these can adjust the initial complexity found.



Tetris
The *Tetris* interface main function is to provide information on the current status of the player's game. Game play is only affected by this interface if the next block is not shown.

Complexity: Low



Silent Hill 3
Silent Hill 3 uses the UI as a part of extended game-play. If the player does certain things within the game, he can release new portions of the UI which in turn give information, such as accurate health count. These abilities strongly assist in making some of the game completion routes doable.
Complexity: Medium

Figure 12: UI Examples - *Tetris* (top), *Silent Hill 3* (bottom)

3.3.3 Interaction Complexity

Interaction complexity is defined as two things: 1st, how much social interaction is needed for a person to play a game, and 2nd, the amount of interaction and how complicated the player interaction is with the NPCs or environment.

Social Interaction in a first person shooter death match or non co-op requires the only interaction being a connection to at least one other player to play. No talking is required other then taunting the other players or perhaps a good game at the end of a match. However, already a step up is a first person shooter CTF game. A successful team will support one another and give feedback about their various successes in locating and capturing the flag or chasing down an enemy. Even when playing a CTF match with/against the computer the bots are still giving more feedback and giving more support then with a standard death match. Social interaction continues to get more complex with games such as *World of Warcraft*, because although it is not actually required to speak with others to play the game, a very complex series of tools are available to allow interaction with other players that will make the game more dimensional and interesting for a player. Things such as auction Houses, chat channels, groups, raids and team player vs. player. Even a step up from this is games such as Eve which allow players to create a corporation. This corporation has taxing and insurance systems as well as other positions that can affect the effectiveness of the corporation such as HR manager – basically attempting an emulation of real life.

Even if the player is playing alone there is still interaction complexity between the player and the friendly NPCs of the game as well as with the environment.

Interaction Complexity has been split into 5 variables with 2 main types: Game System Interaction and Player to Player Communication.

Type	Sub-Type
Game System Interaction	Player/NPC Simulated Communication
	Environmental Interaction
Player to Player Communication	Necessity of Organization
	Game Supported Organization
	Communication Venues

Table 5: Interaction Complexity Variables

3.3.3.1 Game System Interaction

Game system interaction covers all interaction between the player and the friendly non-player characters (NPC) as well as the feedback the environment gives upon interaction.

Player/NPC Simulated Communication

This includes how much script each NPC is given to interact with or immerse the character as well as the roles they have that interact with the character. For instance a game could require a player to protect an NPC for a period of time (*Half-Life 2*) or to gain faction with a NPC to get something required to advance in a quest chain (*World of Warcraft*).

Tony Hawk's Pro Skater 4 (Neversoft, 2003)
The NPCs in this game are used as a means to introduce the goals for each level.

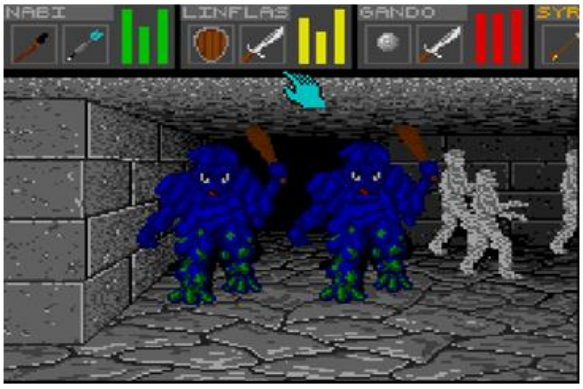
Complexity: Low

Elder Scrolls IV: Oblivion
The NPCs in *Oblivion* are able to protect/be-protected, converse between themselves, react to reputation, follow, have personalities, have personal issues, react to how familiar they are with the player and have that familiarity adjusted.
The NPCs in this game are meant to help make the game more personal for the player.
Complexity: High

Figure 13: Player/Npc Examples - *Tony Hawk's Pro Skater 4* (top), *Elder Scrolls IV: Oblivion* (bottom)

Environmental Interaction

Environmental interaction is related to the engagement level of the game and often the game play as well. It may be possible that very few people would desire this at anything less than a high but, it does add a significant layer of visual complexity to the game.



Dungeon Master (FTL Games, 1982)
Dungeon Master, an older but well loved game, requires the player to pull knobs and levers or step on pressure plates to adjust the environment. (Discover traps, open doors, etc.)

Complexity: Low

Half Life 2
In *Half Life 2* the player's ability to move and adjust things in the environment is used as a means to move the plot forward. The player can pick up, drop, or throw items; burn, electrocute, or freeze certain things; permanently damage walls; and turn, pull, or switch items to make areas accessible.

Complexity: High

Figure 14: Environmental Examples - *Dungeon Master* (top), *Half Life 2* (bottom)

3.3.3.2 Player to Player Communication

Player character to player character interaction is only available for games that allow at least two players to play together. However, it adds a large amount of complexity to the game by the inherent idea of having a thinking, unpredictable human being behind the other controls. Communication between players to do a game task inherently creates complexity. In light of this, most games include a support structure for, at the very least, co-op games. These structures give a variety of ways that humans can interact from within the game: From the simple action of taunting other players (*Quake 4 Death Match*) to a group of 72 people working together to reach one goal (*Everquest*).

It must be noted, that people often can cope with a degree of uncertainty between player to player complexities. If something seems out of the ordinary, it can often be ignored because people can just be strange.

It should also be noted that a fair amount of the communication that happens between players goes on outside of the game.[3] This inherently adds a new social dimension to games, but because it does not affect the game play per say it has not been included as a type of complexity.

Necessity of Organization

This is the amount of social activity that is required to play the game to the fullest. There is a big difference between a game which allows the players to level through it alone (solo), one that requires 6 people (a group) to accomplish something or even one that requires 40 people (a raid).

Quake 4
Quake 4 does not necessarily require organization but *can* have organization.

Complexity: Low

Everquest
Everquest requires 72 people working together to access a large portion of the content.

Complexity: High

Figure 15: Necessity of Organization Examples - *Quake 4* (top), *Everquest* (bottom)

Game Supported Organization

This is the amount of organization that the game supports. It also includes all of the support available for each of the organizations. Meaning – a game could have the possibility of a group, a guild, or a corporation, etc., but are these just fancy titles? Or are they heavily supported by different abilities.

[3] This phenomenon is defined as a *game artifact.* Games are inherently considered social, because even if a game does not have social communication within it, most players will discuss with their friends a new game that they have been playing or compare scores in a racing game.

Battlefield 2142 (Digital Illusions CE, 2006)
Commanders can set way points and see squad make-up.

Complexity: Low

Eve Online (CCP Games, 2003)
Eve has a massive amount of game supported organization. They have Corporations which include a CEO, grantable roles, voting, application review, taxation, owning buildings, ranks, messages, etc. The game also includes smaller parties (gangs) and medium sized parties (fleets). These parties have teleport, regroup and promotion options.
Complexity: High

Figure 16: Supported Organization Examples - *Battlefield 2142* (top), *Eve Online* (bottom)

Communication Venues

This area includes all the possible means of written or voice communication between the players within the game. This includes all chat channels and any Voice Over IP (VOIP).

Titan Quest:Immortal Throne (Iron Lore Entertainment, 2006)
Titan Quest only has 3 possible channels of communication: tell, party, or all.

Complexity: Low

World of Warcraft (WoW)
WoW has 9 open channels as well as party, guild, say, shout, raid, officer and tell channels. There is also the possibility to communicate via emotes and Voice over IP (neither pictured here).

Complexity: High

Figure 17: Communication Examples - *Titan Quest: Immortal Throne* (top), *World of Warcraft* (bottom)

3.3.4 Setup

Setup includes everything that a player can do to before entering a game. This includes avatar creation and all menus used to adjust the information of the incoming game. It also includes all of the choices you see immediately upon loading a game such as single player, multiplayer, options, customize, and username/pw requests. The main question that is being looked at is: *How many choices can a player make before entering a game that affects his in game experiences?*

These choices can create implications for the game play a player can't know until they begin to play the game. Some issues with setup might turn a player from a game immediately and others, like class creation, might affect complexity later on.

The setup area has been split into six over-reaching variables. These variables fall under two main headings: Game-Type Setup and Avatar Setup.

Type	Sub-Type
Game-Type Setup	Single Play – General Setup
	Single Play – Game Mode
	Multi play – With other people (Co-Op)
	Multi play – Against other people
Avatar Setup	Game play Relevant Characteristics
	Aesthetic Characteristics

Table 6: Setup Complexity Variables

3.3.4.1 Game-Type Setup

Single Play - General Setup

This area includes difficulty level, map/level choices, AI opponent numbers and any other options related to the general setup of the game. This area has the largest effect on the game play the player will encounter.

Quake 4
To start a *Quake 4* single play game, you need to pick one thing: Your difficulty level.
Complexity: Low

Civilization 4
Civilization's game setup allows for adjustments to the world, difficulty and opponent amounts. Within these there is the possibility of 5 climates, 3 sea levels, 6 world sizes, 7 eras, 20 planet types, 9 difficulty levels, 6 victory conditions, 13 side options, and 4 speeds. Mix and match these to your heart's content, as it would take years to play through every combination.
Complexity: High

Figure 18: General Setup - *Quake 4* (top), *Civilization 4* (bottom)

Single Play - Game Mode

This area is where the player chooses the single player game type: campaign/scenario, skirmish, etc.

This is also were a player chooses to resume/load a game or start a new one.

Half-Life 2
The single player game mode of Half-Life 2 only has one game mode. (the campaign)

Complexity: Low

Medieval Total War 2 (MTW2)
MTW2 has 6 different choices of single-player game mode type. One of which is the tutorial, leaving 5 types. The Historical Battle type has a choice of 7 Battles; the Custom Battle type has 55 options, and the Grand Campaign has 17 choices (not including character). For a grand total of 94 options with more options available once a certain amount of the game has been conquered.
Complexity: High

Figure 19: Game Mode Examples – *Half-Life 2* (top), *Medieval Total War 2* (bottom)

Register to Play

One thing to note; there are those games, such as MMORPGS and some web games, such as *Runescape* (Jagex Ltd., 2001) and *Habbo Hotel* (Sulake Corporation, 2001), that have no single play or multi-play options. That is because the world is usually static – i.e. unchanging. Therefore, the complicated part of setting up these games is actually the registration rather than the game setup. So, any complication that arises is about the usability of the registration process and, as stated before, usability is too big of a subject to discuss in this thesis.

Multiplayer - Co-Op (Team Based)

Co-Op means that the player will be playing with teammates against either the computer or other players. If a player is the host they could adjust all the variables related to the co-op such as: victory requirements, amount of teams, type of game, team flags/mascot/tunic etc. This area also includes the variety of co-op games available to the player.

TitanQuest: Immortal Throne
Co-Op in *TitanQuest* is extremely simple. Only one option is allowed – to play the single player game, but with more people. The player can choose to host or join, via LAN or Internet. If he chooses to host his only options are: Name, Password, Max Players, Level Range and Auto Party. Very quick.
Complexity: Low

Unreal Tournament 2004 (UT2K4)*(Epic Games, 2004)*
UT2K4 comes with 8 different multi-player game types and dozens of map choices. There are also, of course, a large amount of player made modifications that add even more game types.

Complexity: High

Figure 20: Team Based Examples - *Titan Quest: Immortal Throne* (top), *Unreal Tournament 2004* (bottom)

Multiplayer - Non Co-Op

Non Co-Op means that every player is for himself against other players. This area includes all the choices a player must make to play against other players including: game type, map, server, etc.

iSketch (Wahlstedt, 1999)
Isketch is an online Pictionary type game that is a prime example of a simple multiplayer non co-op game to setup. To play against others all a player must do is press Play Now→Type Username→Enter a Room. There are no other options.
Complexity: Low

Quake 4
Quake 4 is considered a complex none co-op setup because of the number of possible game type and map options it has available. Just visible here are 3 game types: Duel, Death match, Freezetag on 8 different maps. This just touches the tip of the iceberg on possible modifications available for Quake 4.
Complexity: High

Figure 21: Non Co-Op Examples - *iSketch* (top), *Quake 4* (bottom)

3.3.4.2 Avatar Setup

Game play Relevant

Game play relevant setup includes avatar class or position, stats, religion, and skills. It also includes anything that will affect how the game will react to that specific avatar.

For instance, if a person playing an American football game chose an offensive player with good mobility and a strong throwing arm then he would might load the game as a quarterback and find information about offensive players and possible ways to move the ball forward. While if in that same game, a player might chose a defensive player who was heavy and strong with quick hands, he might find himself loading the game as a Defensive Center and be seeing defensive plays and tackling suggestions.

Civilization 4
Civilization 4 is a good example of a simple skill setup game. Each avatar option has already been assigned their initial skills and it is not possible to change those. The result is only 18 possible civilizations with 8 alternative leaders for a choice of 26.
Complexity: Low

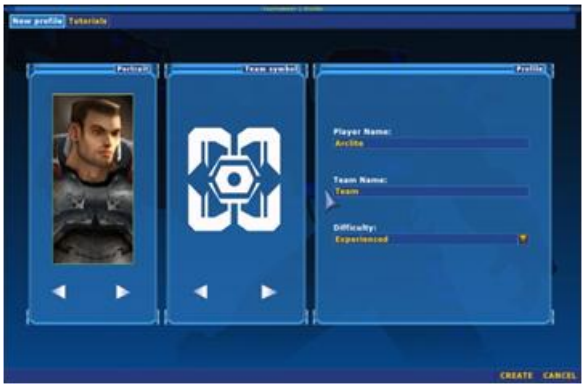
Elder Scrolls IV: Oblivion
In *Oblivion* there are six different things required to set up a custom avatar (not including aesthetics): Race, Gender, Skills (Class), "Birth sign" (Religion), and Attribute and Skill Bonuses. The end result is literally millions of possible combinations that will have massive effect on the way the player (has to) play his avatar in the game.
Complexity: High

Figure 22: Gameplay Relevant Examples - *Civilization 4* (top), *Elder Scrolls IV: Oblivion* (bottom)

Aesthetic

Everything about the avatar's appearance is included in the Aesthetic area. This includes race, armor, features, and gender. High complexity games, in this area, are those that have numerous sliding bars or numbers to adjust every visible thing on the avatar. They give the player the ability to make their avatar look exactly how they want.

Games that are low on the complexity scale in this area only give a number of pre-made choices for the avatar or even just the choice of male or female, such as *Titan's Quest: Immortal Throne* allows. A game with no complexity would have no ability to affect the look of the avatar at all – something found in *Half-Life 2* where the player is a pre-made character named Dr. Freeman in the storyline.



Unreal Tournament 2004 (UT2k4)
Unreal avatar aesthetic setup is one of the most simple available. The only avatars available are about 25 pre-made selections with no alteration possibilities.
Complexity: Low

The Sims 2 (Maxis, 2004)
The Sims 2 allows for the creation of just about any shape, size, or look for their "Sims" (i.e. avatars). The amount of choice combinations allows the player to make an avatar look like anything they want. Other games with a setup similar to this are *Elder Scrolls IV: Oblivion*, *Second Life* (Linden Research, Inc., 2003) and *Everquest 2* (Everquest 2, PC, 2004).
Complexity: High

Figure 23: Aesthetic Examples - *Unreal Tournament 2004* (top), *The Sims 2* (bottom)

4 The Model

The original goal for this thesis is to present a way to analyze the connections between player types and their desires when playing a game. To facilitate this goal a means of first extracting and then presenting this data in an understandable form must be explained. This chapter will introduce the thesis Model which builds on the knowledge gathered in Chapters 2 and 3. It will explain how useful results can be gotten based on the different splits in player motivations and complexities explored in those earlier chapters.

In addition to presenting the Model, this chapter also provides the fundamental logic for how information would be gathered from quantitative surveys to create some of the input to the Model.

Also, for purposes of illustration, an overview will be given of the surveys that are used to gather data for this thesis. During this discussion, the fundamental logic relative to the surveys will be reviewed to provide a foundation for Chapter 5, in which the Model is tested in association with the surveys.

4.1 The Model

The purpose of the Model is to enable and sort information that will help game developers decide where their efforts would be best spent on a game development project. To do so the Model needs to integrate the target audience and their preferences, as seen in the figure below.

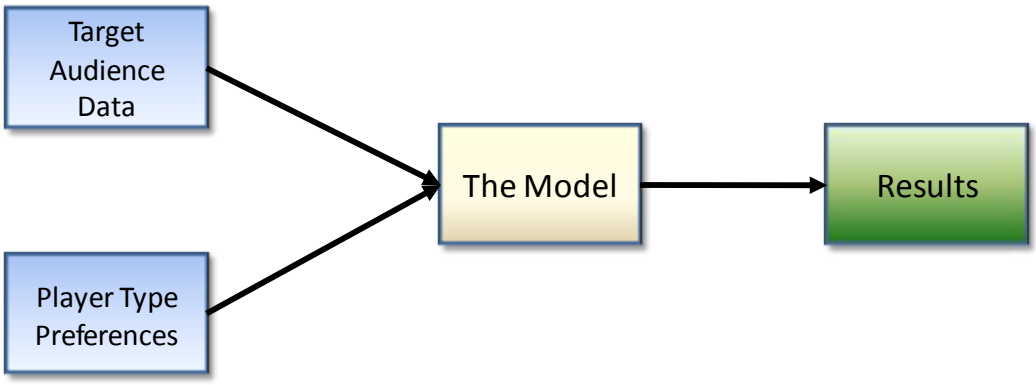


Figure 24: The Model

The target audience initially would be defined by the game developing company based on historical user data. Target audiences are not generally organized based on user motivation. They are developed for and reside in demographic groups. Therefore a company would need to apply a user sorting framework such as the one created by Nick Yee (2005c) to further classify their targeted market.

As mentioned in the Introduction, the goal for this thesis is to present a way to link the relationship between player types and their desires when playing a game. The company can come up with the player types, but a player's desires (motivational) are something that would need to be extracted from a centralized quantitative study. Examples of the how the data could be obtained are shown in chapter 4.2: Questionnaires.

In order for the Model to work in practice data from a complexity study should be blended with the knowledge the company has on what type of people that are expected, or predicted, to play the game. The company must know what sort of complexity those types of gamers prefer. Once this information is available, the correct conclusions will be drawn and the probability of a marketing success will improve.

The implementation of a successful Model has three steps that are intended to define the process required to get useful information.

Three Step Process:

1) Gather Required Data

First the company has to find data about player type preferences. Versions of this data will hopefully be publicly available, but for this discussion, the example is taken from the smaller survey done as part of this thesis. For purposes of illustration, an example of the preferred data can be seen below.

		Complexity 1			Complexity 2			Complexity 3			Complexity 4		
Motivations	**Total**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Motivation 1	29	-0,45	0,17	0,28	-0,55	0,17	0,38	-0,66	0,38	0,28	-0,69	0,28	0,41
Motivation 2	28	-0,57	0,11	0,46	-0,50	0,18	0,32	-0,61	0,39	0,21	-0,64	0,21	0,43
Motivation 3	29	-0,41	0,10	0,31	-0,52	0,21	0,31	-0,66	0,34	0,31	-0,62	0,28	0,34
Motivation 4	10	-0,70	0,00	0,70	-0,50	0,10	0,40	-0,50	0,50	0,00	-0,60	0,20	0,40
Motivation 5	19	-0,63	0,26	0,37	-0,58	0,21	0,37	-0,58	0,42	0,16	-0,58	0,37	0,21
Motivation 6	23	-0,26	0,22	0,04	-0,35	0,30	0,04	-0,74	0,35	0,39	-0,57	0,30	0,26
Motivation 7	9	-0,78	0,11	0,67	-0,67	0,00	0,67	-0,67	0,22	0,44	-0,89	0,00	0,89
Motivation 8	3	-1,00	0,00	1,00	-1,00	0,00	1,00	-0,67	0,67	0,00	-0,67	0,00	0,67
Motivation 9	13	-0,46	0,15	0,31	-0,62	0,23	0,38	-0,23	0,38	-0,15	-0,54	0,23	0,31
Motivation 10	11	-0,36	0,00	0,36	-0,55	0,27	0,27	-0,27	0,36	-0,09	-0,64	0,45	0,18

Table 7: Example Preference Data

We already know that the Company has knowledge of the demographic groups who they expect (or hope) to have playing the game. Cross linking this data with the motivational information may require a lot of work, as my studies suggest that the motivational types do not map directly to demographic groups (although some connections can be expected).

The company will thus have to make estimates or possibly ask their user base to take surveys such as Yee's test (2005a). Roughly speaking this should not be difficult as a death match type game can expect a great many more competitive people than role-players. The estimates should have percentage values for each motivation of their target audience. For example, the target audience could be comprised of 90% motivation 2, 70% motivation 5 and 50% motivation 6. Since most people are motivated by multiple things, it is important to realize that the percentage of each motivation type that makes up the projected player group need not combine to 100%.

2) Go Through Model for each type of Complexity

Now that the target audience has been defined one has to calculate the target audiences' preferences for each complexity. Do they prefer high (**C**), medium (**B**) or low (**A**) complexity? Their preferences can be found from a table like Table 7. Then, referencing to that table, a formula can be used to pin point the target audiences preferences for A, B, and C in complexity 1.

The formula is as follows:

A = ((percentage of target audience with motivation 1 as primary motivation)*(Relationship of motivation 1 and complexity 1 as seen in Table 7 for A)) + ((next motivation) *(relationship))[4] = Target Audiences' Preferences for A.

The formula is then repeated for B and C so that A, B, and C all have values.

For example, assuming 100% of the target audience is Motivation 1 focused and 50% Motivation 2 focused, using the relationship data found in Table 7. The formula would look like the following:

Complexity 1:

A =	**100%*(-0.45) + 50%*(-0.57) =**	**-45 – 28,5 =**	**-73,5**
B =	**100%*(0.17) + 50%*(0.11) =**	**17 + 5,5 =**	**22,5**
C =	**100%*(0.28) + 50%*(0.46) =**	**28 + 23 =**	**51**

Table 8: Example of the Model's formula

From this one could draw the conclusion that C would be clearly preferred by the target audience. This formula is then repeated for all complexities. However, in this format it still is far from obvious what the game developer is actually supposed to do. This problem is solved in the third step.

[4] The formula continues until all identified target audience motivation percentages have been multiplied by their relationship to that complexity.

3) Visualize Data and Draw Conclusions

	Complexity 1	Complexity 2	Complexity 3	Complexity 4
A	-73,5	-34	28	-20
B	22,5	0	12	-30
C	51	34	-40	50

Table 9: Basic Model Results

Table 9 is filled using the formula presented in Step 2. It is a sample of a finalized table; containing 4 complexities (the numbers are basically random, though the trends visible in the table are not). While the preference is still very much toward the complex, exceptions can be seen.

It is important to notice that from a developers point of view the important value isn't actually the value of A, B or C. It is the difference between A and B, and B, and C. When you change the table to reflect this, you suddenly get very interesting results.

	Complexity 1	Complexity 2	Complexity 3	Complexity 4
A->B	96	34	-16	-10
B->C	28,5	34	-52	80

Table 10: Refined Model Results

Assuming all steps in complexity require the same amount of effort (oversimplification, but the financial and resourcing sides are far out of scope for this thesis); it is now extremely obvious what must be done first: Complexity 1 should be moved from A to B immediately, as the target audience would vastly prefer that (**+96**).

The next most beneficial moves are more complex, as it really depends on whether you plan ahead. If the developer has resources for one more increase in complexity, adding more of Complexity 2 seems like the right way to go (**+34**). However, if they can afford two more increases, they should go all the way from A to C in Complexity 4 (**+70**), which is slightly better than its best competitor , which is greatly increasing Complexity 2, going from A to C (**+68**).

4.2 Questionnaires

4.2.1 Yee's Questionnaire

So why is Yee's questionnaire actually important for this? Because there must be a way to differentiate between the different player types or everyone would just be one mass of players. It is not necessarily trying to be said that Yee's motivations are the ones that every game company could be used. Instead, because this Model is theoretical, they work to fit the needs required. However, if this Model were to be made as something other than theoretical, a game company would have to know who their player types are, as well as the different percentage of each player type who plays a game. Yee's work supplies this thesis with the possible target audience types who play a game.

As seen from Chapter 2, each participant who takes Yee's questionnaire is given an answer sheet that indicates their percentage of interest in a motivation. This results in something like the following:

Motivation	Percentage
Achievement	68
Mechanics	40
Competition	92
Socializing	15
Relationship	88
Teamwork	33
Discovery	4
Role-Playing	2
Customization	1
Escapism	78

Table 11: Example Percentages from Yee's Results

According to Yee, those results that are between 40 - 60% are not that interesting because they fall within the average results. So what is interesting, are those that are either high or low. Because it would add a large layer of complexity to think of each percentage as a separate number, for this thesis, the results will be split into three categories: not motivated (0 - 40%), average (40 - 60%) and motivated (60 - 100%). And in turn, the results that are most interesting for this thesis are the desires of those participants who are motivated by something. So, looking at the participant above, it can be seen that this person is motivated by Achievement, Competition, Relationship and Escapism. This means that these are the only motivations that his scores will be applied to in the overall Model.

4.2.2 Complexity Questionnaire

The second facet of information to help flesh out the Model will be gathered from a complexity questionnaire. This questionnaire consists of 18 questions intended to pinpoint the participants desired level of game complexity. The questions are derived from the proposed complexity types in Chapter 3.

Each question has 3 possible choices listed in order of complexity from least to most. As introduced in chapter 3, complexity is ranked from least (**A**) to most complex (**C**). The participants are asked to rank these 3 choices from most desired to least desired.

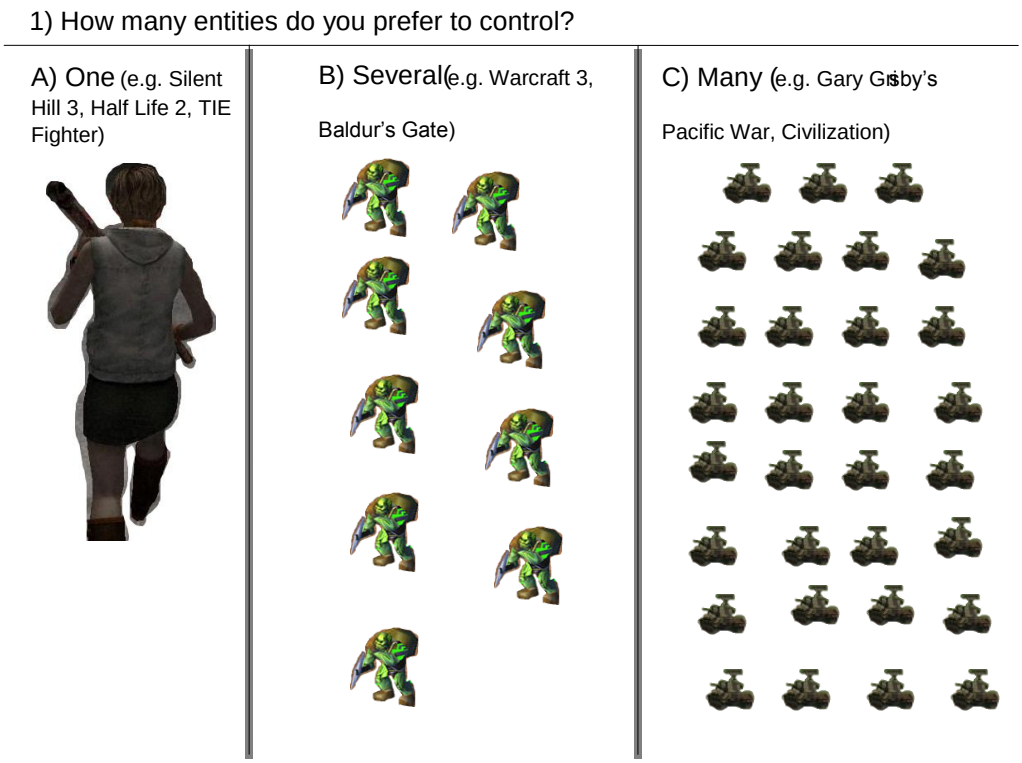


Figure 25: Complexity Questionnaire Example

As an example, a participant could choose their order of preference from most to least desired to be: BCA. From this we can deduce that the player prefers to control several entities and if they had a choice between one or many entities, they would choose many.

The end result from the complexity questionnaire for each participant will look something like this.

Participant	Width	Ending	NPC/Player	Controlled Entities	Actions per Entity	Environmental Interaction
Participant01	BCA	CBA	CAB	BCA	CBA	BAC

Table 12: Complexity Questionnaire Results Example

4.2.3 Interpreting Results

Once the data has been gathered from the questionnaire, it is important to understand how the answers are interpreted. After a participant finishes the questionnaires two different things are known: The motivation(s) of the participant and their desired amount of complexity for 18 different variables from most to least preferred. Currently those answers are in the format of A, B & C, so how do these letters become numbers? The following must occur.

1. **Step One**

In the first step the letters are translated to numbers. This is done to guarantee that the full order of preference has an impact in the results, rather than just the highest priority one. The most preferred option gains one (**+1**) point, the least preferred losing one (**-1**).

	Answer	A	B	C
Participant01	CBA	-1	0	1
Participant02	CAB	0	-1	1
Participant03	BCA	-1	1	0
Participant04	ACB	1	-1	0
Participant05	BAC	0	1	-1

Table 13: Questionnaire Result Analysis, Part 1

2. **Step Two**

Now that the letters have been transferred to numbers, those participants with a motivation of 60+ in a given category need to be identified, after which their answers will be considered for evaluating the motivational player groups opinion on a given complexity.

	Answer	A	B	C
Participant01	CBA	-1	0	1
Participant02	CAB	0	-1	1
Participant03	BCA	-1	1	0
Participant04	ACB	1	-1	0
Sum		-1	-1	2

Table 14: Questionnaire Result Analysis, Part 2

In the table above we can see that Participant05 from the earlier table did not share some motivational trait with the others. Now we can see that this motivational group clearly prefers high complexity in this particular complexity.

3. Step Three

Of course reading the previous table, readers might have noticed that despite the clear triumph of high (**C**) complexity; actually both low (**A**) and medium (**B**) complexities were still preferred by no less than 25% of the participants. The last thing to include in the math is the number of participants, since the numerical score by itself is quite meaningless. High complexity in a given complexity receiving '+10' is basically meaningless unless the sample size is known.

To this end, the result is divided by the sample size.

	A	B	C
Sum	-1	-1	2
Divided by 4	-25%	-25%	+50%

Table 15: Questionnaire Result Analysis, Part 3

Now the result has reached its meaningful form. While high complexity prevailed, the audience was split. Had the result been -100%, 0%, 100%, the result would have been totally clear. Under the circumstances only a minor bias toward high complexity can be seen.

Considering the lack of specific percentages when it comes to primary motivations (those above 60% and those below), having very exact percentages in these tables is highly questionable. For example the answers could be rounded in the following way:

Value	Title	Color
-1	Lowest Preference	
-.66	Very Low Preference	
-.33	Low Preference	
0	Neutral	
.33	High Preference	
.66	Very High Preference	
1	Highest Preference	

Table 16: Rounding Example

5 Results

The idea behind this chapter is two-fold. First of all the results are taken from the survey and analyzed. This is done in quite a bit of detail, since the nature of the questionnaire is in many ways as important as the Model itself. Without a framework for getting the (motivational) player type preferences, the Model is essentially meaningless. Not to mention some of the data is quite interesting.

After that, a few imaginary examples are created, to which the Model is then applied, using the data gained from analyzing the survey results and an imaginary target audience.

5.1 Getting Player Type Complexity Preferences

To get the player type complexity preferences 50 participants (35 male, 15 female) were found from personal e-mail lists, open game forums and from within games. The results were gathered over a four-day period and then analyzed. The small sample size is not a problem since the idea is to test the Model and find possible ways to develop it further

5.1.1 Interpreting the player type results

The raw data that is being interpreted here can be seen in Appendix C: Yee's Results, where the full results from all participants are. Below the motivational averages from the raw data can be seen, with the gender differences clearly shown.

	Advancement	Mechanics	Competition	Socializing	Relationship	Teamwork	Discovery	Role-Playing	Customize	Escapism	Total
Men	74,91	70,49	71,80	32,23	38,51	53,46	27,60	23,77	35,80	27,40	45,60
Women	46,13	36,13	51,00	43,13	68,60	56,93	33,53	23,73	44,53	49,80	45,35
Total	66,28	60,18	65,56	35,50	47,54	54,50	29,38	23,76	38,42	34,12	45,52

Figure 26: Statistics from Yee's Query

While the results are interesting and certainly fit conventional wisdom (men being significantly more competitive than women), they are not interesting from the Model's perspective.

In the simplistic version of the Model introduced in this thesis, the interest is on people's primary motivations; therefore, no real difference is shown between those that score 0 and 59 in a particular motivation in Yee's test. The primary motivations are visible in the figure below.

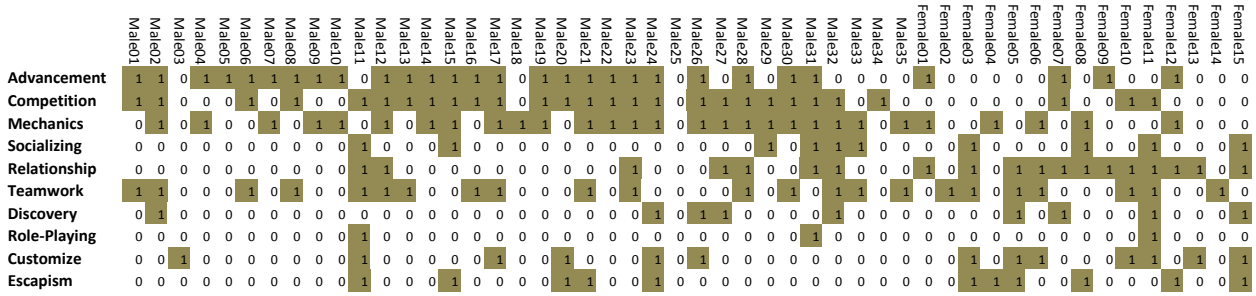


Figure 27: Primary Motivation Breakdown from Yee's Query

The most popular motivations among the participants were advancement, mechanics and competition, each with nearly thirty. The least popular by a fair margin was role-playing, with merely three. Considering the sample, the results seem far from surprising. Nearly half of those taking the test were so called power gamers from the author's online guild.

Of the fifty participants, all but six participants had two or more motivations. One of the six with less than two motivations had zero motivations for playing, indicating that they probably aren't the most active of gamers. Sixteen participants had five or more separate motivations, indicating that it probably doesn't take much to convince them to play most types of games, with two of these having an impressive seven different motivations for playing games. In average the participants had 3.5 motivations.

5.1.2 Interpreting Complexity Questionnaire

5.1.2.1 Overview

The raw data that is being interpreted here can be seen in Appendix C: Yee's Results, where the full results are. The analyzed data is the raw data, after it has gone through the steps described in Chapter 4.2.3: Interpreting Results.

A few base rules are good to keep in mind when reading the results:

1. A value of -1 indicates *unanimous* lowest preference given by the motivational group[5].
2. A value of 1 indicates *unanimous* preference given by the motivational group.
3. Values close to 0 indicate indifference toward a complexity by the motivational group.

[5] *Motivational Group* refers to the group of participants who were motivated by a particular motivation. For instance, looking at Figure 27 shows that there are 29 participants in the advancement motivational group.

Naturally is important to keep in mind that extreme values and extreme splits might also indicate problems with the questionnaire (an option that is clearly the best, or options that are so similar that people with the same preferences pick them in wildly different orders).

For each complexity variable the analysis will be laid out according to the following table:

Pro-complexity	C is greater than .50
Pro-simplicity	A is greater than .50
Anti-complexity	C is lower then -.50, but A is not greater then .50
Anti-simplicity	A is lower then -.50, but C is not greater then .50
Neutral	No values over .50 or below -.50
Anomalous	Subjectively decided, but most often if B clearly wins.

When looking at the results, it seems that usually complexity is king. However, if a close look at the actual numbers is taken, a more interesting case emerges. Yes, often complexity still IS king, but in some cases it is more desired then others and in some cases a lack of complexity is downright detested.

When looking at the results it should also be noted that a number of interesting trends occur that suggest the Model's viability. For instance Achievers were not so much concerned with the amount of entities they controlled, but instead with the Actions those entities could perform. Role-Players and Discoverers very strongly cared about complex Player/NPC Interaction with Role-Players having a strong desire for complex Environmental Interaction as well. Other telling ones are: Relationship, Discoverers, Customizers and Role-Players – who found a complex character creation system (aesthetics) desirable.

It should also be noted, that role-players often agree unanimously on many aspects because their sample size was so small (only three participants). Other motivations with relatively small sample sizes were Socializing, Discovery, Customize, and Escapism. Thus, the results may not be generally applicable.

5.1.2.2 Setup

Setup		General Setup			Game Mode			Co-Op			Non-Co-Op			GP Rel.			Aesthetic		
Motivations	**Total**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Advancement	29	-0,45	0,17	0,28	-0,55	0,17	0,38	-0,66	0,38	0,28	-0,69	0,28	0,41	-0,83	0,17	0,66	-0,79	0,24	0,55
Mechanics	28	-0,57	0,11	0,46	-0,50	0,18	0,32	-0,61	0,39	0,21	-0,64	0,21	0,43	-0,82	0,18	0,64	-0,79	0,18	0,61
Competition	29	-0,41	0,10	0,31	-0,52	0,21	0,31	-0,66	0,34	0,31	-0,62	0,28	0,34	-0,79	0,14	0,66	-0,79	0,21	0,59
Socializing	10	-0,70	0,00	0,70	-0,50	0,10	0,40	-0,50	0,50	0,00	-0,60	0,20	0,40	-0,70	0,30	0,40	-0,70	0,20	0,50
Relationship	19	-0,63	0,26	0,37	-0,58	0,21	0,37	-0,58	0,42	0,16	-0,58	0,37	0,21	-0,89	0,11	0,79	-1,00	0,21	0,79
Teamwork	23	-0,26	0,22	0,04	-0,35	0,30	0,04	-0,74	0,35	0,39	-0,57	0,30	0,26	-0,74	0,26	0,48	-0,57	0,22	0,35
Discovery	9	-0,78	0,11	0,67	-0,67	0,00	0,67	-0,67	0,22	0,44	-0,89	0,00	0,89	-1,00	0,00	1,00	-1,00	0,00	1,00
Role-Playing	3	-1,00	0,00	1,00	-1,00	0,00	1,00	-0,67	0,67	0,00	-0,67	0,00	0,67	-1,00	0,00	1,00	-1,00	0,00	1,00
Customize	13	-0,46	0,15	0,31	-0,62	0,23	0,38	-0,23	0,38	-0,15	-0,54	0,23	0,31	-0,85	0,15	0,69	-1,00	0,08	0,92
Escapism	11	-0,36	0,00	0,36	-0,55	0,27	0,27	-0,27	0,36	-0,09	-0,64	0,45	0,18	-0,73	0,09	0,64	-0,82	0,09	0,73

Figure 28: Results for Setup Complexity and Motivations Comparison

Single Player - General Setup

Pro-complexity	Socializing, Discovery, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Mechanics, Relationship
Neutral	Advancement, Competition, Teamwork, Customize, Escapism
Anomalous	-

Single Player - Game Mode

Pro-complexity	Discovery, Relationship
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Mechanics, Competition, Socializing, Relationship, Customize, Escapism
Neutral	Teamwork
Anomalous	-

Multiplayer - Co-Op (Team Based)

Pro-complexity	-
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Mechanics, Competition, Relationship, Teamwork, Discovery
Neutral	Customize, Escapism
Anomalous	Socializing, Role-Playing

Socializers and Role-Players appear to sincerely desire the middle amount of complexity. They do not want the simplest options; yet also do not want the most complex options. In general there is a clear trend to the middle. Teamworkers, are also not exactly surprising as the strongest against simplicity as most detest a lack of options.

Multiplayer - Non Co-Op

Pro-complexity	Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Customize, Escapism
Neutral	-
Anomalous	Discovery

Discoverers appear oddly gung-ho.

Game Play Relevant

Pro-complexity	Advancement, Mechanics, Competition, Relationship, Discovery, Role-Playing, Customize, Escapism
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Socializing, Teamwork
Neutral	-
Anomalous	-

There seems to be some quite strong feelings of like and dislike in this, especially among discoverers.

Aesthetic

Pro-complexity	Advancement, Mechanics, Competition, Socializing, Relationship, Discovery, Role-Playing, Customize, Escapism
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Teamwork
Neutral	-
Anomalous	-

5.1.2.3 Game play

Gameplay Motivations	Total	Width			Ending			Entity Amount			Effects on E.			Actions per Entity			AI			UI		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Advancement	29	0,52	-0,07	-0,45	-0,62	0,24	0,38	-0,45	0,24	0,21	-0,66	0,55	0,10	-0,93	0,21	0,72	-0,83	0,10	0,62	-0,72	0,31	0,41
Mechanics	28	0,64	-0,04	-0,61	-0,64	0,36	0,29	-0,57	0,11	0,46	-0,86	0,50	0,36	-0,86	0,25	0,61	-0,93	0,04	0,79	-0,79	0,25	0,54
Competition	29	0,55	-0,03	-0,52	-0,59	0,41	0,17	-0,45	0,24	0,21	-0,76	0,62	0,14	-0,83	0,34	0,48	-0,76	0,17	0,48	-0,76	0,28	0,48
Socializing	10	0,90	-0,10	-0,80	-0,80	0,40	0,40	-0,90	0,00	0,90	-1,00	0,70	0,30	-0,80	0,30	0,50	-0,70	0,30	0,40	-1,00	0,20	0,80
Relationship	19	0,74	0,00	-0,74	-0,63	0,32	0,32	-0,63	0,26	0,37	-0,74	0,58	0,16	-0,79	0,32	0,47	-0,84	0,32	0,53	-0,84	0,32	0,53
Teamwork	23	0,83	-0,04	-0,78	-0,48	0,30	0,17	-0,43	0,13	0,30	-0,61	0,52	0,09	-0,70	0,43	0,26	-0,83	0,13	0,70	-0,70	0,30	0,39
Discovery	9	0,67	0,00	-0,67	-0,11	0,11	0,00	-0,33	0,00	0,33	-0,78	0,33	0,44	-0,89	0,22	0,67	-1,00	0,11	0,89	-0,67	0,11	0,56
Role-Playing	3	1,00	-0,67	-0,33	-0,67	0,33	0,33	-1,00	0,00	1,00	-1,00	0,33	0,67	-1,00	0,00	1,00	-1,00	0,00	1,00	-1,00	0,67	0,33
Customize	13	0,69	-0,15	-0,54	-0,54	0,15	0,38	-0,62	0,15	0,46	-0,77	0,46	0,31	-0,85	0,38	0,46	-0,85	0,31	0,54	-0,69	0,15	0,54
Escapism	11	0,64	0,09	-0,73	-0,55	0,18	0,36	-0,45	0,09	0,36	-0,91	0,73	0,18	-0,91	0,27	0,64	-0,73	0,45	0,27	-0,64	0,36	0,27

Figure 29: Results for Game Play Complexity and Motivations Comparison

Width

Pro-complexity	-
Pro-simplicity	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Customize, Escapism
Anti-complexity	-
Anti-simplicity	-
Neutral	-
Anomalous	Role-Playing

Role-Players, while technically being pro-simplicity are interesting in that they are 100% pro-simplicity but also very anti mid simplicity (i.e. B), and then a bit less vigorous about being anti high complexity. Also, as a whole this result is interesting. It's hard to say if the result occurred because of an error in the questionnaire or if the average person really does prefer a straight route to the ending (which would in turn make *The Sims* and *World of Warcraft* extremely suspicious).

Ending

Pro-complexity	Socializing, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Mechanics, Competition, Socializing, Relationship, Role-Playing, Customize, Escapism
Neutral	Teamwork, Discovery
Anomalous	-

It should be noted that, in this complexity variable, Socializing, Teamwork, and Role-Playing are all text book cases of Anti-Simplicity. All 3 are very much against simplicity, yet seem to not care about the difference between medium and high complexity.

Entity Amount

Pro-complexity	Socializing, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Mechanics, Relationship, Customize
Neutral	Advancement, Competition, Teamwork, Discovery, Escapism
Anomalous	-

Effects on Entity

Pro-complexity	Socializing, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Mechanics, Relationship, Customize
Neutral	Advancement, Competition, Teamwork, Discovery, Escapism
Anomalous	-

This category has the biggest win for 'B' overall with only Discoverers and Role-Players preferring C.

Actions per Entity

Pro-complexity	Advancement, Mechanics, Socializing, Discovery, Role-Playing, Escapism
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Competition, Relationship, Teamwork, Customize
Neutral	-
Anomalous	-

Artificial Intelligence

Pro-complexity	Advancement, Mechanics, Relationship, Teamwork, Discovery, Role-Playing, Customize
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Competition, Socializing, Escapism
Neutral	-
Anomalous	-

User Interface

Pro-complexity	Mechanics, Socializing, Relationship, Discovery, Customize
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Competition, Teamwork, Escapism
Neutral	-
Anomalous	Role-Playing

Role-players, while 100% anti simplistic, are also clearly more interested in a middle amount of complexity then a high one for UI. Socializers also exhibit a quite high desire for complexity.

5.1.2.4 Interaction

Interaction		PC/NPC			Environment			Necessity of Org.			Game Supp Org			Comm Venues		
Motivations	**Total**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Advancement	29	-0,79	0,17	0,62	-0,86	0,21	0,66	-0,52	0,21	0,31	-0,59	0,28	0,31	-0,69	0,00	0,69
Mechanics	28	-0,89	0,11	0,79	-0,82	0,21	0,61	-0,68	0,18	0,50	-0,79	0,39	0,39	-0,86	0,00	0,86
Competition	29	-0,72	0,17	0,55	-0,86	0,21	0,66	-0,52	0,21	0,31	-0,52	0,34	0,17	-0,62	0,03	0,59
Socializing	10	-0,80	0,10	0,70	-1,00	0,30	0,70	-0,60	0,10	0,50	-0,70	0,70	0,00	-1,00	0,10	0,90
Relationship	19	-0,74	0,11	0,63	-0,84	0,47	0,37	-0,47	0,21	0,26	-0,63	0,42	0,21	-0,74	-0,05	0,79
Teamwork	23	-0,65	0,22	0,43	-0,78	0,22	0,57	-0,65	0,09	0,57	-0,61	0,48	0,13	-0,65	-0,17	0,83
Discovery	9	-1,00	0,00	1,00	-0,89	0,33	0,56	-0,44	0,33	0,11	-1,00	0,22	0,78	-1,00	0,00	1,00
Role-Playing	3	-1,00	0,00	1,00	-1,00	0,00	1,00	-1,00	0,33	0,67	-1,00	0,67	0,33	-1,00	0,00	1,00
Customize	13	-0,69	0,08	0,62	-0,77	0,38	0,38	-0,31	0,23	0,08	-0,62	0,46	0,15	-0,62	-0,08	0,69
Escapism	11	-0,73	0,18	0,55	-0,82	0,36	0,45	-0,27	0,18	0,09	-0,73	0,27	0,45	-0,82	0,00	0,82

Figure 30: Results from Interaction Complexity and Motivations Comparison

Player/NPC

Pro-complexity	Advancement, Mechanics, Competition, Socializing, Relationship, Discovery, Role-Playing, Customize, Escapism
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Teamwork
Neutral	-
Anomalous	-

Environment

Pro-complexity	Advancement, Mechanics, Competition, Socializing, Teamwork, Discovery, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Relationship, Escapism, Customize
Neutral	-
Anomalous	-

Necessity of Organization

Pro-complexity	Mechanics, Socializing, Teamwork, Role-Playing
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Competition
Neutral	Relationship, Discovery, Customize, Escapism
Anomalous	-

Game Supported Organization

Pro-complexity	Discovery
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	Advancement, Mechanics, Competition, Relationship, Teamwork, Customize, Escapism
Neutral	-
Anomalous	Socializing, Role-Playing

Both Socializing and Role-Playing are anti-simplicity, yet clearly for mid complexity rather than high. It could also be noted, that only Discovery actually desires high complexity and most are pushing more towards mid.

Communication Venues

Pro-complexity	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-Playing, Customize, Escapism
Pro-simplicity	-
Anti-complexity	-
Anti-simplicity	-
Neutral	-
Anomalous	-

The high amount of complexity desired by all here, suggests either a badly made question or a sincere desire among gamers to have a large amount of options for communication.

5.2 Model Test 1

Project: Story Orientated FPS Based on a Famous Brand

A game developer is about to begin production on a story orientated FPS based on a famous brand. They have defined their target audience as fans of said brand, the existing FPS player base (mainly single player orientated only), and a small amount of true fps competitors.

After having identified their target audience they begin to follow the steps of the Model.

Step 1

They believe that their target audience will be comprised of the following percentages of each motivation:

Motivation	Percentage
Advancement	50
Mechanics	10
Competition	50
Socializing	30
Relationship	10
Teamwork	30
Discovery	15
Role-Playing	5
Customization	5
Escapism	30

Table 17: Model Test 1 - Target Audience Percentages

Step 2

Using the rounded answers found in Appendix E and the percentages they identified the company formulated the amounts for A, B, & C in each of the 18 complexity types.

Example 1	General Setup	Game Mode	Co-Op	Non-Co-Op	GP Rel.	Aesthetic	Width	Ending	Entity Amount	Effects on E.	Actions per Entity	AI	UI	PC/NPC	Environment	Necessity of Org.	Game Supp Org	Comm Venues
A	-1.02	-1.34	-1.33	-1.60	-0.66	-0.67	1.77	-1.35	-1.09	-1.81	-1.94	-1.70	-1.70	-1.65	-2.10	-1.37	-1.62	-1.76
B	0.30	0.61	0.79	0.71	0.13	0.20	-0.03	0.71	0.36	1.44	0.76	0.41	0.73	0.17	0.76	0.58	0.89	0.00
C	0.86	0.76	0.51	0.89	0.59	0.59	-1.37	0.73	1.01	0.33	1.16	1.26	1.01	1.52	1.42	0.86	0.61	1.76
A to B	1.32	1.95	2.13	2.31	0.80	0.86	-1.81	2.06	1.46	3.24	2.70	2.12	2.43	1.83	2.85	1.95	2.51	1.76
B to C	0.56	0.15	-0.28	0.18	0.45	0.40	-1.34	0.02	0.65	-1.11	0.40	0.84	0.28	1.35	0.66	0.28	-0.28	1.76

Table 18: Model Test 1 - Formulation Results

Step 3

After finding the amounts for A->B then B->C (Lower Portion of Example 1 Table) the company could then use the resulting table to identify which areas of complexity were most important for them to focus on. Because the company is beginning a brand new game, their level of complexity will start at A or most simple.

According to the answers from the Model, this company can identify that their greatest gains would be made increasing the complexity to initially a medium level (B) in the Effects on Entity (**+3.24)**, Environment Interaction (**+2.85)**, Actions per Entity (**+2.70)** and then Game Supported Organization (**+2.51)**. Also, it can be seen that there is an overall cool reaction to adjusting the complexity from B->C, but if the developer had enough time, Player/NPC and Communication Venues could be upgraded further.

Most ideally a company would have the ability to identify the cost the jump from A->B, and then B->C in each complexity would take for their company. However, this is impossible to predict beforehand as every company has different resources and in-house know-how available.

5.3 Model Test 2

Project: Sequel to a Multiplayer Orientated RTS

A game developer is about to begin work on the sequel to a popular multiplayer orientated RTS. They will be using the same engine to create the game as was used in the original. They identify their target audience as fans of the original game and online gamers in general.

Step 1

They believe that their target audience will be comprised of the following percentages of each motivation:

Motivation	Percentage
Advancement	80
Mechanics	60
Competition	80
Socializing	30
Relationship	0
Teamwork	25
Discovery	10
Role-Playing	0
Customization	25
Escapism	25

Table 19: Model Test 2 – Target Audience Percentages

Step 2

Using the rounded answers found in Appendix E and the percentages they identified the company formulated the amounts for A, B, & C in each of the 18 complexity types. Also, because this is a sequel (and therefore the players will already have a certain level of expectation from the game) the company needs to identify where their previous game would be ranked in each complexity. This is signified by the green shading in Table 20.

Example 2	General Setup	Game Mode	Co-Op	Non-Co-Op	GP Rel.	Aesthetic	Width	Ending	Entity Amount	Effects on E.	Actions per Entity	AI	UI	PC/NPC	Environment	Necessity of Org.	Game Supp Org	Comm Venues
A	-1,44	-1,83	-1,94	-2,25	-0,84	-0,84	2,40	-2,06	-1,59	-2,60	-2,89	-2,53	-2,31	-2,45	-2,89	-2,01	-2,25	-2,55
B	0,35	0,97	1,11	1,07	0,21	0,30	0,00	0,99	0,53	1,90	1,11	0,53	0,99	0,23	1,11	0,92	1,20	0,00
C	1,16	1,06	0,84	1,17	0,75	0,78	-1,95	1,07	1,31	0,50	1,68	1,80	1,52	2,16	2,05	1,29	0,87	2,55
A to B	1,78	2,81	3,05	3,32	1,05	1,14	-2,40	3,05	2,12	4,50	4,00	3,06	3,30	2,68	4,00	2,94	3,45	2,55
B to C	0,81	0,08	-0,26	0,10	0,53	0,48	-1,95	0,08	0,78	-1,40	0,58	1,27	0,53	1,93	0,94	0,36	-0,33	2,55

Table 20: Model Test 2 - Formulation Results with Previous Game Estimates (in green shading)

Step 3

After having identified the amounts for each jump as well as the previous games complexity levels, the company can then begin to identify which areas of complexity could be changed for the greatest benefit.

It seems the complex plot twists and several alternative finishes were not a particularly big hit with the gamers. Even though the existing game engine could easily create similar width (**C**) again, it seems obvious the resources should be allocated elsewhere, leaving width minimal (**A**). This would save resources and bring an impressive gain (**+4,35**).

Other than that, it seems no resources have been wasted in the previous game. However, there are many areas where the target audience would appreciate added complexity. The greatest gains would come from increasing the effects on entity (**+4,50**) and environmental complexity (**+4,00**). Increased options for player vs. player would also be very popular (**+3,32**), though taking that too far doesn't seem very rewarding (only **+0,10** from B to C). If there are any resources left, they should be focused on increasing communication venues, since there are constant and obvious benefits to making it a lot more complex, even if the return on investment is worse than in the other options (**+2,55**).

6 Conclusions

6.1 Summary

This thesis introduced two separate areas of study, player motivations and game complexity. The first area, player motivations, was introduced with reference to work by PhD Nick Yee. The second area, game complexity, was split using a combination of research on complexity and subjectively defined variables. Each of these areas had their own assessment or questionnaire that was taken by 50 participants.

A Model of complexity was then introduced and two examples of its use were presented using the data from the assessment results. The assessment results were also analyzed to discover any possible trends and discern if visible flaws could be found in the complexity questionnaire.

The results of the analysis found one probable mistake in the questionnaire and one possible one. The first was in the width variable in which players preferred simplicity in width and the second was the effects on entity where the participants seem to have found a lot of complexity undesirable. Yet for both of these, one game, *The Sims*, refutes them. *The Sims* is the best selling computer game of all time, with the whole franchise having sold over 70 million units (Wikipedia, 2007g). According to the results none of the motivations would have enjoyed the broad width of the game, or perhaps width is just not linked to complexity so straightforwardly, and only Role-Players would have found the amount of effects on entity satisfying.

Otherwise though, the results seemed intuitive and fit the feedback given by some participants; For instance, Female01, who is motivated by Advancement, Competition, and Relationship, according to her answers on the complexity questionnaire, appeared to predominately prefer complexity with the exception of the variables, necessity of organization, game supported organization and communication venues. She was also one of only six who indicated a desire for high complexity in the Width variable. Upon further questioning she admitted to Civilization IV as being the most recent game she had played and tellingly mentioned that, “I find games where you play one character with one narrow mission kind of boring” (Female01, 2007). *Civilization IV* as a game definitely had a target audience of advancement and competition; it is, by most standards, considered to be quite complex yet also lacks the need for player to player organization or complicated communication venues.

6.2 Thesis Questions

In the introduction of thesis two main questions were presented to be answered:

1. Is it possible to develop a Model of gaming that can reliably predict what game variables attract differently motivated players?
2. What are the primary variables of a game and how are they linked to player motivations?

Now it is the time to look through and see if these questions were indeed answered.

First question:

The goal of this thesis was to see if a Model of complexity could be theoretically viable. This goal seems to have been ascertained. There is, however, an obvious need for more in depth research in the areas of different complexity types as the ones chosen for this thesis were entirely subjective. The information required to turn this Model from a theory into a scientifically accepted Model is massive, but seemed doable.

Second question:

The primary variables of a game were identified as 18 different complexity types under 3 main headings: Game Play, Interaction, and Setup. In order to link player motivations to these variables two questionnaires were given, one to identify the motivations and the second to pinpoint what variables each motivation desires more of. The information gathered from these questionnaires was combined together to produce a series of 3 tables (as shown in chapter 5) that directly show how each variable is linked to a player's motivations.

However, it must be re-iterated that the results from this thesis *suggest* a Model to answer the research questions, but the Model should only be considered as an early hypothesis as further research is still needed to develop the Model.

6.3 Self Critique

There are a few areas in this thesis that stand out for self-critique:

1. The applicability of Yee's study should be tested. While other studies suggest that his should be applicable, it is only assumed now.

2. The use of non-rounded numbers in one area (complexity) combined with rounding of numbers in the area of motivations. It could have been extremely interesting to use the percentage a participant was motivated by something in combination with their desires in that area, basically adding a weight to their choice. I.e. a participant with an advancement motivation percentage of 63% would have a factorial of .63 to adjust her choice of C and a participant with a 91% in advancement would have a factorial of .91.
3. The complexity breakdown and questionnaire requires more thorough analysis to validate it.
4. More correlation methods could have been used between the data. This could have provided more arguments to support the hypothesis in this thesis.

6.4 Further Study

Further study about the areas of this thesis could literally fill books. To start, no viable means of identifying the different areas of a game were found at the time this study was done. As well as, most work on complexity in games seemed to focus most often on usability. Obviously when an organized game developer makes a game they do identify the different areas of their proposed game, but no universal identifiers were found. Further study into division of game areas and what makes them complex could prove extremely interesting.

And to further this, there could be the possibility to develop heuristics based on this if complexity was broken down and combined with a work like Yee's. Obviously, to create numbers reliable enough for large game developers such as Epic or Vivendi to adopt, huge amounts of quantitative data would need to be processed.

Secondly, the breakdown of the A, B, & C as either 1 (preferred) 0 (neutral) or -1 (not-preferred) could be greatly improved upon. A scale similar to one used in Yee's questionnaire (i.e. a 5 step scale) for each level of complexity would give more detailed insight. The main problem with the current scale is that it automatically assumes that the last choice is not-preferred, but some participants pointed out that it wasn't that they disliked or didn't prefer one level of complexity, they just happened to like it less than the one they chose first.

And last, if the final research on the Model continued to use the work of Nick Yee, it might be extremely valuable to include the opinions of those who were completely unmotivated by a particular motivation type.

6.5 Closing Thoughts

At the beginning of this thesis, in Chapter 1.4: Motivations, I developed a list of reasons why I wished to do the research for this thesis, reasons which were initially generated through my observation of the obvious differences between my husband and myself as players. A look at Appendix C and Appendix D will illustrate this disparity in preferences. In those, I am Female09 and my husband is Male01. Right off the bat, a difference can be seen. We only have one similar motivation, advancement. After this, I am only motivated by relationship and my husband is motivated by mechanics and teamwork.

Looking at our complexity preferences I found that I only prefer seven of eighteen complexities to be high. My husband prefers eleven of eighteen. This in itself is not earth shattering, but when one inspects *where* we desire our complexity we find that I desire PC/NPC interaction, more communication venues, and additional Co-Op possibilities while my husband desires a lot of game modes, additional game setup choices, and more required organization. To summarize, I can see the trends that align our motivations with our desired complexity and more importantly understand that my husband and I are just motivated differently and why. At the very least knowing, rather than wondering, has given me peace of mind.

Appendix A: Yee's Questionnaire

Note: The following questionnaire has been slightly adjusted to reduce the numbers of pages it occupied. The content remains the same, but a more compact way of presenting the possible answers was used.

The following is a web-based assessment of your gaming motivations. It consists of 39 questions and should take about 3-5 minutes to complete. When you finish the assessment, your approximate percentile ranks based on a sample of 3200 MMORPG players will be generated.

How interested are you in the precise numbers and percentages underlying the game mechanics? (i.e., chance of dodging an attack, the math comparing dual-wield to two-handed weapons, etc.)

Not Interested At All	Slightly Interested	Somewhat Interested	Very Interested	Extremely Interested

How important is it to you that your character is as optimized as possible for their profession / role?

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How often do you use a character builder or a template to plan out your character's advancement at an early level?

Never	Seldom	Sometimes	Often	Always

Would you rather be grouped or soloing?

Much Rather Group	Rather Group	In-Between	Rather Solo	Much Rather Solo

How important is it to you that your character can solo well?

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How much do you enjoy working with others in a group?

Not At All	A Little	Some	A Lot	A Great Deal

How important is it to you to be well-known in the game?

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How much time do you spend customizing your character during character creation?

Not At All	A Little	Some	A Lot	A Great Deal

How important is it to you that your character's armor / outfit match in color and style?

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How important is it to you that your character looks different from other characters?

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How much do you enjoy exploring the world just for the sake of exploring it?

Not At All	A Little	Some	A Lot	A Great Deal

How much do you enjoy finding quests, NPCs or locations that most people do not know about?

Not At All	A Little	Some	A Lot	A Great Deal

How much do you enjoy collecting distinctive objects or clothing that have no functional value in the game?

Not At All	A Little	Some	A Lot	A Great Deal

How important are the following things to you in the game?

Leveling up your character as fast as possible.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Acquiring rare items that most players will never have.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Becoming powerful.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Accumulating resources, items or money.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Knowing as much about the game mechanics and rules as possible.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Having a self-sufficient character.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Being immersed in a fantasy world.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

Escaping from the real world.

Not Important At All	Slightly Important	Somewhat Important	Very Important	Extremely Important

How much do you enjoy doing the following things in the game?

Helping other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Getting to know other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Chatting with other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Competing with other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Dominating/killing other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Exploring every map or zone in the world.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Being part of a friendly, casual guild.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Being part of a serious, raid/loot-oriented guild.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Trying out new roles and personalities with your characters.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

Doing things that annoy other players.

Not Enjoyable At All	Slightly Enjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable

How often do you do the following things in the game?

How often do you find yourself having meaningful conversations with other players?

Never	Seldom	Sometimes	Often	Always

How often do you talk to your online friends about your personal issues?

Never	Seldom	Sometimes	Often	Always

How often have your online friends offered you support when you had a real life problem?

Never	Seldom	Sometimes	Often	Always

How often do you make up stories and histories for your characters?

Never	Seldom	Sometimes	Often	Always

How often do you role-play your character?

Never	Seldom	Sometimes	Often	Always

How often do you play so you can avoid thinking about some of your real-life problems or worries?

Never	Seldom	Sometimes	Often	Always

How often do you play to relax from the day's work?

Never	Seldom	Sometimes	Often	Always

How often do you purposefully try to provoke or irritate other players?

Never	Seldom	Sometimes	Often	Always

Appendix B: Complexity Questionnaire

Desired Complexity Questionnaire

- Please rank the options in order of preference
  (i.e. C, B, A), (B, A, C) etc.
- Notice:
  - The games given as examples are only listed to make the example more familiar.
  - The important thing is *what* each game does, not which game it is.
  - If you are confused about a question, please ask. It is important that the difference between the complexities is understood.
  - A is always the least complex, B the middle ground and C the most complex

1) How many entities do you prefer to control?

A) One (e.g. Silent Hill 3, Half Life 2, TIE Fighter)

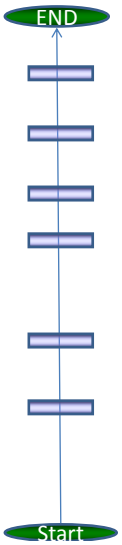
B) Several(e.g. Warcraft 3, Baldur's Gate)

C) Many (e.g. Gary Grisby's Pacific War, Civilization)

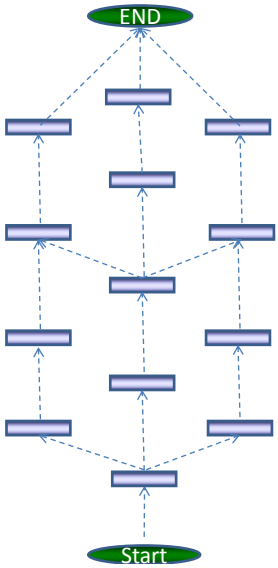
2) How many plot possibilities do you prefer?

Plot Element Non-Plot Elements

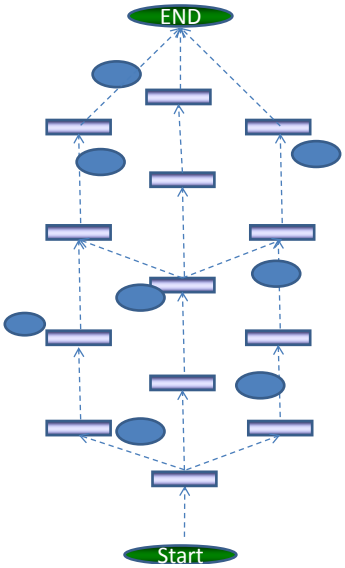
A) Linear (e.g. Half Life 2, TIE Fighter, Solitaire)



B) Several possible paths (e.g. Knights of the Old Republic , Bioshock, Warcraft 3)

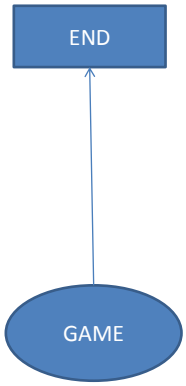


C) Many paths+Additional Elements (e.g.Elder Scrolls IV: Oblivion, Medieval Total War, Civilization)

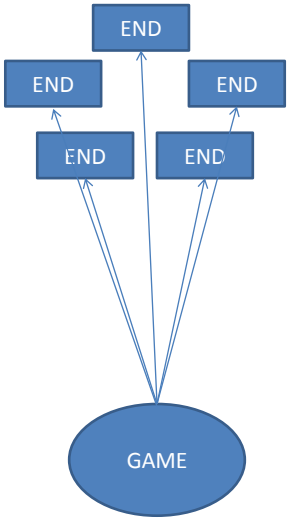


3) What type of ending do you prefer?

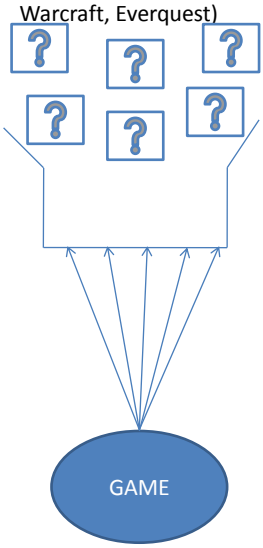
A)Linear, 1 possible ending (e.g. Half Life 2, F.E.A.R.)



B) Multiple Endings (e.g. Silent Hill 3, KoToR, Bioshock, Civilization)



C) Open Ended (e.g. The Sims, World of Warcraft, Everquest)



4) How many ways do you wish to be able to effect your avatar(s)?

A) A couple ways (e.g. Half Life 2, Quake 4)

Add Health/Armor

B) Several Ways (e.g. World of Warcraft, Bioshock)

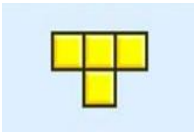
Adjust Gear

Adjust Talents

C) Many Ways (e.g. Black and White, The Sims)

5) How many skills/abilities would you prefer your avatar to have use of?

A) A couple
(e.g.Tetris, Quake 4)



- Rotate Clockwise
- Rotate Counter-
- Clockwise
- Move Left, Right or Down

B) Several
(e.g.Bioshock, Titan Quest)

- Take Pictures
- Run, Jump, Crouch
- 18 passive skills (at once)
- 6 active skills (at once)
- 6+ weapons

C) Many
(e.g.Elder Scrolls IV: Oblivion)

- Make Potions
- Gain Levels
- Adjust Stats
- 100+ Spells
- Run, Jump, Crouch
- Sneak, Lockpick
- Own houses
- 21+ skills to level

6) Do you prefer the AI style/abilities of:

A) The player doesn't really have to worry about what the AI is doing

•Proximity Attraction
•Random Routes

B) The player out thinks the computer without excessive effort

(e.g. Quake 4, Ability Civilization)

•Choose Weapons
•Brag, Taunt, Flee
•Dodge
•Choose Routes

C) The AI will give the player a run for their money

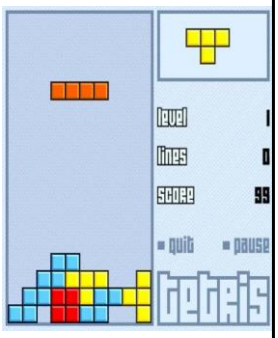
(e.g.Bioshock)

Adapt to player actions
•Variety of Attacks
•Choose Routes
•Taunt, Flee
•Heal, Search, Brag
•Dodge, React
•Use Environment

7) Do you prefer the User Interface style of:

A) What you see is what you get, very few things that can be clicked.

(e.g. Tetris, Snake)



UI only gives visual information. Not possible to change/effect the game play with it.

B) Adjusts as a part of the game (e.g. Silent Hill 3)

•Ability to effect/change UI By playing the game In certain ways.
•Changed UI is then Required to play The game for a new End goal

C) Hundreds of items to click

(e.g. World of Warcraft, Civilization 4)

Tutorial Introduction Otherwise whole UI visible immediately

Figuring out UI necessary to play game

8) How much interaction do you prefer with the games NPCs?

A) Information Only
(e.g.Tony Hawk Pro Skater)

•The NPCs are used as a means to introduce the goals of each level.

B) Interactive and Often Personal
(e.g. Half Life 2)

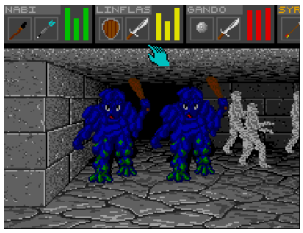
•Life-like movement
•React to Presence and Greet
•React to Failure to follow
•Recognition
•Protect/Be-Protected
•Follow

C) Adjustable Relationship
(e.g.Elder Scrolls: Oblivion, KoToR)

•Protect/Be-Protected
•Personalities and Issues
•Converse Between Themselves
•React to Reputation
•Follow
•React to Familiarity
•Adjust familiarity with mini-game

9) How much interaction do you prefer with the environment?

A) Minimal
(e.g.Dungeon Master, Quake 4)



•Knobs, Levers
•Pressure Plates
(close pits, open doors, etc.)

B) Some
(e.g.Bioshock)

•Pick up/drop/throw items
•Burn, Electrocute, Freeze Certain Items
•Hacking Machines
•Switch Items

C) Extensive
(e.g.Half Life 2, UFO)

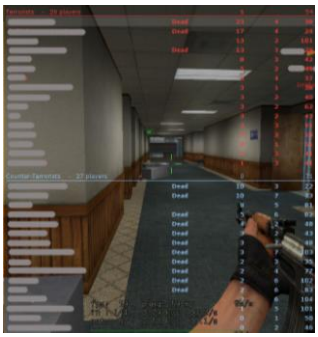
•Uses Physics Engine to Forward the Plot
•Pick up/drop/throw items
•Burn, Electrocute or Freeze Certain Things
•Permanently Damage Walls and Immobile Objects
•Turn, Pull, Switch Items To make areas accessible

10) How much required organization do you prefer when playing a game?

A) Minimal
(e.g. Quake 4, Doom 3)

Organization
Possible but
Not required

B) Some
(e.g.Counter-Strike,
Baldur's Gate)



2 teams - communication necessary to be successful. (a team = 2 or more players)

C) Extensive
(e.g.Everquest, World of Warcraft)

72 organized people to explore much of the content

11) How much organization do you want available in the game?

A) Minimal
(e.g.Battlefield 2142,
Quake 4)

Commander can choose 'waypoint' and can see his 'squad'

B) Several
(e.g. World of Warcraft,
Everquest)

Guild
-Add Notes, Guild Info, Guild Message,
-Remove/Add Member, Rank System
-Sort Members (via name, zone, level or class)

Raid
-Remove/Add Member, Ready Check,
-Raid Info, Add Assists, Move Members,
-Promote Extra Leaders
-Set loot abilities
-Maximum 40 players

Party
-Remove/Add Member, Promote, Set Targets,
-Adjust Dungeon Difficulty
-Set loot type
-Set PVP status
-Maximum 6 players

Friends/Ignore
-Add/Remove players

C) Extensive(e.g. Eve)

Corporation
-Add Notes, Guild Info, Guild Message,
-Remove/Add Member, Rank System
-Sort Members (via name, zone, level or class)
-Votes, Application, Bank Accounts
-Taxation, Own Buildings
-CEO, Grantable Roles(director, etc.)
-Unlimited members
-Etc., (emulates RL as much as possible)

Gangs (Party)
- 50 max members
-Teleports
-Add/Remove member
-Promote to Leader

Friends/Ignore
-Add/Remove players

Fleet
- Teleports (Regroups, Some to some, etc.)
-Promotions (5+ ranks)
-250 max members

12) How many types of communication venues do you prefer?

A) A Few (e.g.Titan Quest, Quake 4)

Available Communication:
•Tell
•Party
•Say

B) Several (e.g. Call of Duty 2)

+

Voice over IP (VOIP)

Available Communication:
•General
•Team
•'Quick' Pre-Made
• Messages
•VoIP

C) A lot (e.g. World of Warcraft, Everquest, Runescape)

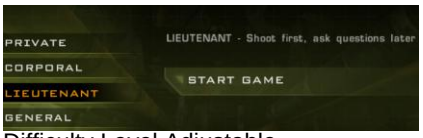
+

Voice over IP (VOIP)

Available Communication:
•9 Open Channels
•Party, Guild (2 types)
•Say, Shout
•Raid (2 types)
•Tell (2 types)
•VoIP
•Emotes

13) How much do you want to be able to adjust the game before you begin to play?

A) Difficulty Only (e.g.Quake 4,)



Difficulty Level Adjustable

B) Some (e.g.Unreal Tournament 2004 (UT2K4)

Manage/Adjust Team Mate Bots

C) A lot (e.g.Civilization 4, Majesty)

Choose:
•Difficulty Level
•Avatar
•World Size
•World Characteristics
•Victory Conditions
•Extra Events

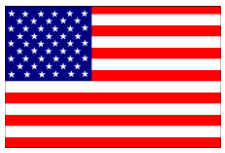
14) How many single player 'campaigns/types' do you prefer?

A) One (e.g.Half Life 2, Bioshock)

Straight to game

B) Some (e.g.Battlezone)

Choice of Russia or America



2 game type choices

C) A lot (e.g.Medieval Total War, Solitaire)

5 Game Type Choices

15) How many different types of team based Multiplay do you prefer?

A) One (e.g.Titan Quest, Dungeon Siege)

Multiplayer = Same as Single Player Just Harder

B) Some (e.g. Majesty)

Adjustable:
–Victory Conditions
–Enemy Types
–Money Amounts
–Game type
–Map Type
–Cheating

C) A lot (e.g.UT2K4, Quake 4)

8 Co-Op types available in retail game. Numerous more available from mod community.

16) How many different types of non team based multi-play do you play?

A) One (e.g. iSketch, OR a single mode from a more complex game)

Only one game Type to play.

B) Some (e.g.Medieval Total War 2, OR some modes from a more complex game)

Three game play Types. Ability to Choose different Battle setups for Each.

C) A Lot (e.g.Quake 4, Civilization, enjoying many of their game modes regularly)

5+ mods Included with game Many more Available From the Modding community

17) How much would you prefer to adjust your avatars skills/abilities before playing?

A) A few (e.g. Civilization 4, Tony Hawk Pro Skater 4)

2 preset skills
2 preset abilities

B) Several (e.g. The Sims)

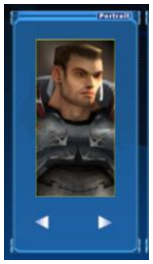
5 abilities to adjust at will

C) A Lot (e.g.Elder Scrolls:Oblivion)

Can Adjust: Race, Gender, Skills (Class), "Birthsign" (Religion), and Attribute and Skill Bonuses. Totaling thousands of combinations

18) How many options do you prefer to effect your avatars looks?

A) Minimal
(e.g.UT2K4, Quake 4, Solitaire Titan Quest)



Pre-Made Avatars. Choose from about 30.

B) Several
(e.g. World of Warcraft)

5 feature types approx. 8 choices for each

C) A Lot
(e.g.The Sims 2, Everquest 2, Second Life, Elder Scrolls: Oblivion)

Just about everything is adjustable

Appendix C: Yee's Results

Participant	Advancement	Mechanics	Competition	Socializing	Relationship	Teamwork	Discovery	Role-Playing	Customize	Escapism
Male01	99	98	47	46	52	100	2	10	2	4
Male02	100	98	100	20	39	72	94	56	59	16
Male03	38	30	10	0	5	20	33	17	89	21
Male04	66	29	77	21	39	23	6	12	54	7
Male05	98	4	50	0	16	5	4	35	17	59
Male06	98	90	29	12	9	94	17	2	2	7
Male07	78	19	73	60	5	23	42	16	5	6
Male08	86	97	36	4	17	72	3	4	16	6
Male09	77	30	91	5	9	51	1	8	17	14
Male10	76	19	90	3	9	40	34	16	29	9
Male11	34	74	27	97	81	75	19	97	97	83
Male12	88	82	72	59	88	75	4	2	4	7
Male13	71	89	36	0	5	92	3	4	5	1
Male14	98	97	90	59	39	26	33	35	54	17
Male15	95	82	95	70	37	40	11	22	54	92
Male16	86	83	26	4	39	92	0	16	17	15
Male17	97	99	100	8	28	99	29	15	94	1
Male18	42	29	86	14	57	54	34	51	27	17
Male 19	61	83	63	47	25	26	42	16	41	26
Male20	99	98	47	30	28	14	51	21	68	86
Male21	81	94	100	56	28	95	9	17	41	85
Male22	81	83	95	30	39	40	5	4	8	59
Male23	98	96	90	13	69	61	16	4	16	27
Male24	95	94	77	3	39	2	73	7	79	85
Male25	35	52	10	8	9	10	7	59	37	9
Male26	99	96	94	12	28	14	77	11	97	1
Male27	58	98	88	21	95	6	68	31	38	13
Male28	91	73	97	35	81	75	0	25	53	42
Male29	50	63	90	85	39	40	4	12	16	15
Male30	83	98	98	13	52	100	7	59	2	26
Male31	90	75	94	83	94	40	54	93	43	41
Male32	59	98	100	94	99	86	92	28	41	7
Male33	22	7	97	71	9	99	16	12	2	15
Male34	54	97	48	12	15	37	19	4	2	17
Male35	39	13	90	33	25	73	57	10	27	23
Female01	67	20	91	0	74	2	25	57	1	48
Female02	1	1	57	0	9	83	0	4	1	58
Female03	41	11	50	69	81	76	3	41	68	93
Female04	53	7	64	50	5	13	4	15	9	63
Female05	35	19	41	57	88	72	65	15	88	74
Female06	39	32	98	52	69	93	60	41	94	30
Female07	98	89	24	59	88	59	76	2	17	55
Female08	57	54	74	79	88	58	42	7	15	74
Female09	94	20	50	15	88	59	0	2	26	4
Female10	44	61	48	59	81	75	28	2	67	7
Female11	7	61	24	70	69	88	76	77	68	30
Female12	62	49	74	59	98	23	52	57	26	86
Female13	11	7	16	8	69	55	3	2	67	30
Female14	53	60	36	0	28	92	2	4	54	2
Female15	30	51	18	70	94	6	67	30	67	93

Participant Totals

	Under 40			40-60			Over 60		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Advancement	11	5	6	10	5	5	29	25	4
Mechanics	17	9	8	5	1	4	28	25	3
Competition	12	7	5	9	4	5	29	24	5
Socializing	28	23	5	12	6	6	10	6	4
Relationship	28	25	3	3	3	0	19	7	12
Teamwork	16	12	4	11	7	4	23	16	7
Discovery	33	25	8	8	5	3	9	5	4
Role-Playing	39	29	10	8	4	4	3	2	1
Customize	27	20	7	10	9	1	13	6	7
Escapism	32	26	6	7	4	3	11	5	6

Appendix D: Complexity Questionnaire Results

Setup																								
Participant	**General Setup**				**Game Mode**				**Co-Op**				**Non-Co-Op**				**GP Rel.**				**Aesthetic**			
Male01	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	ABC	1	0	-1	CBA	-1	0	1	BAC	0	1	-1
Male02	CBA	-1	0	1	ACB	1	-1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male03	CAB	0	-1	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1
Male04	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male05	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1
Male06	ABC	1	0	-1	ABC	1	0	-1	BAC	0	1	-1	BAC	0	1	-1	ABC	1	0	-1	ABC	1	0	-1
Male07	ABC	1	0	-1	BCA	-1	1	0	ABC	1	0	-1	BCA	-1	1	0	BCA	-1	1	0	BCA	-1	1	0
Male08	CBA	-1	0	1	ABC	1	0	-1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male09	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male10	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male11	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male12	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male13	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male14	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male15	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male16	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	ABC	1	0	-1
Male17	BAC	0	1	-1	ABC	1	0	-1	BAC	0	1	-1	CAB	0	-1	1	CBA	-1	0	1	CBA	-1	0	1
Male18	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male19	ABC	1	0	-1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1
Male20	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Male21	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male22	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male23	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Male24	CAB	0	-1	1	CBA	-1	0	1	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male25	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1
Male26	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male27	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male28	CBA	-1	0	1	ABC	1	0	-1	BCA	-1	1	0	BAC	0	1	-1	BCA	-1	1	0	BCA	-1	1	0
Male29	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1
Male30	CAB	0	-1	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male31	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male32	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male33	BCA	-1	1	0	ABC	1	0	-1	CBA	-1	0	1	ABC	1	0	-1	BAC	0	1	-1	ABC	1	0	-1
Male34	BAC	0	1	-1	BAC	0	1	-1	ABC	1	0	-1	BAC	0	1	-1	BAC	0	1	-1	BCA	-1	1	0
Male35	ABC	1	0	-1	BCA	-1	1	0	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1
Female01	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	CAB	0	-1	1	CBA	-1	0	1
Female02	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1
Female03	ABC	1	0	-1	BCA	-1	1	0	ABC	1	0	-1	BCA	-1	1	0	BAC	0	1	-1	BCA	-1	1	0
Female04	ABC	1	0	-1	BAC	0	1	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1
Female05	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Female06	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Female07	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female08	CAB	0	-1	1	ACB	1	-1	0	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Female09	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0
Female10	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female11	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CAB	0	-1	1	CBA	-1	0	1	CBA	-1	0	1
Female12	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female13	CBA	-1	0	1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1
Female14	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CAB	0	-1	1
Female15	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Total		-18	9	9		-24	12	12		-27	17	10		-30	15	15		-36	13	23		-35	12	23

Game Play																																			
Participant	Width				Ending				Entity Amount				Effects on E.				Actions per E.				AI				UI			
Male01	ACB	1	-1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0
Male02	ABC	1	0	-1	ABC	1	0	-1	ACB	1	-1	0	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male03	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	CAB	0	-1	1
Male04	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male05	ACB	1	-1	0	ACB	1	-1	0	ABC	1	0	-1	ABC	1	0	-1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1
Male06	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CAB	0	-1	1	CAB	0	-1	1
Male07	ABC	1	0	-1	BCA	-1	1	0	BCA	-1	1	0	ABC	1	0	-1	BCA	-1	1	0	ABC	1	0	-1	BCA	-1	1	0
Male08	BAC	0	1	-1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male09	CAB	0	-1	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	CAB	0	-1	1
Male10	ABC	1	0	-1	BAC	0	1	-1	BAC	0	1	-1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0
Male11	ACB	1	-1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male12	ABC	1	0	-1	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male13	ACB	1	-1	0	CBA	-1	0	1	CAB	0	-1	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1
Male14	ABC	1	0	-1	BCA	-1	1	0	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	CBAA	-1	-1	-1	CBA	-1	0	1
Male15	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male16	ABC	1	0	-1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male17	ABC	1	0	-1	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male18	CAB	0	-1	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male19	BAC	0	1	-1	CBA	-1	0	1	ACB	1	-1	0	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1
Male20	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male21	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male22	CAB	0	-1	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male23	ABC	1	0	-1	BCA	-1	1	0	CAB	0	-1	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male24	ACB	1	-1	0	ABC	1	0	-1	ACB	1	-1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	ABC	1	0	-1
Male25	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Male26	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male27	BAC	0	1	-1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male28	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1
Male29	ABC	1	0	-1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1
Male30	ACB	1	-1	0	CAB	0	-1	1	CAb	0	-1	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male31	ACB	1	-1	0	BAC	0	1	-1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Male32	ABC	1	0	-1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Male33	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male34	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male35	ABC	1	0	-1	BAC	0	1	-1	CAB	0	-1	1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Female01	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	CAB	0	-1	1	BAC	0	1	-1	CAB	0	-1	1
Female02	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1
Female03	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1
Female04	ABC	1	0	-1	BAC	0	1	-1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	BAC	0	1	-1	BAC	0	1	-1
Female05	ABC	1	0	-1	ACB	1	-1	0	BAC	0	1	-1	BAC	0	1	-1	BCA	-1	1	0	BCA	-1	1	0	BAC	0	1	-1
Female06	ABC	1	0	-1	BAC	0	1	-1	BAC	0	1	-1	CAB	0	-1	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Female07	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female08	ABC	1	0	-1	CBA	-1	0	1	CAB	0	-1	1	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1
Female09	ABC	1	0	-1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0
Female10	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1
Female11	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female12	BCA	-1	1	0	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0
Female13	ABC	1	0	-1	BAC	0	1	-1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Female14	ABC	1	0	-1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1	BAC	0	1	-1
Female15	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Total		31	-2	-29		-29	16	13		-24	13	11		-33	29	4		-40	17	23		-38	10	25		-36	12	24

Interaction																	
Participant	**PC/NPC**				**Environment**				**Nec. Of Org.**				**G. Supp. Org.**				**Comm. Venues**			
Male01	CBA	-1	0	1	CBA	-1	0	1	CAB	0	-1	1	CAB	0	-1	1	CAB	0	-1	1
Male02	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male03	BCA	-1	1	0	CBA	-1	0	1	ABC	1	0	-1	BAC	0	1	-1	ABC	1	0	-1
Male04	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1
Male05	BAC	0	1	-1	CBA	-1	0	1	ABC	1	0	-1	ABC	1	0	-1	CBA	-1	0	1
Male06	CBA	-1	0	1	CBA	-1	0	1	CAB	0	-1	1	CBA	-1	0	1	ACB	1	-1	0
Male07	ABC	1	0	-1	BCA	-1	1	0	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1
Male08	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	BCA	-1	1	0
Male09	ABC	1	0	-1	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1
Male10	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0
Male11	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1
Male12	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1
Male13	CBA	-1	0	1	CBA	-1	0	1	ACB	1	-1	0	CBA	-1	0	1	CAB	0	-1	1
Male14	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male15	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male16	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1
Male17	CBA	-1	0	1	ABC	1	0	-1	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1
Male18	CBA	-1	0	1	CBA	-1	0	1	ABC	1	0	-1	CBA	-1	0	1	ABC	1	0	-1
Male19	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	BAC	0	1	-1	CBA	-1	0	1
Male20	CBA	-1	0	1	CBA	-1	0	1	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1
Male21	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male22	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1
Male23	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male24	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male25	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	BAC	0	1	-1
Male26	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male27	CBA	-1	0	1	CBA	-1	0	1	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1
Male28	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male29	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	BCA	-1	1	0
Male30	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male31	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1	CBA	-1	0	1
Male32	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0	CBA	-1	0	1
Male33	BCA	-1	1	0	CBA	-1	0	1	CAB	0	-1	1	BAC	0	1	-1	CBA	-1	0	1
Male34	ABC	1	0	-1	BAC	0	1	-1	CBA	-1	0	1	BCA	-1	1	0	BCA	-1	1	0
Male35	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CAB	0	-1	1
Female01	BCA	-1	1	0	CBA	-1	0	1	ACB	1	-1	0	ABC	1	0	-1	ABC	1	0	-1
Female02	BAC	0	1	-1	ABC	1	0	-1	ABC	1	0	-1	BAC	0	1	-1	ABC	1	0	-1
Female03	ABC	1	0	-1	BCA	-1	1	0	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1
Female04	BAC	0	1	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1	ABC	1	0	-1
Female05	CBA	-1	0	1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	CBA	-1	0	1
Female06	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CAB	0	-1	1	CAB	0	-1	1
Female07	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Female08	CBA	-1	0	1	BCA	-1	1	0	Cab	0	-1	1	BAC	0	1	-1	CBA	-1	0	1
Female09	CBA	-1	0	1	BAC	0	1	-1	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1
Female10	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1	BAC	0	1	-1	CBA	-1	0	1
Female11	CBA	-1	0	1	CBa	-1	0	1	CBa	-1	0	1	BCA	-1	1	0	CBA	-1	0	1
Female12	CBA	-1	0	1	CBA	-1	0	1	BCA	-1	1	0	CBA	-1	0	1	CBA	-1	0	1
Female13	ABC	1	0	-1	CBA	-1	0	1	ABC	1	0	-1	BAC	0	1	-1	ABC	1	0	-1
Female14	ABC	1	0	-1	CBA	-1	0	1	BCA	-1	1	0	BAC	0	1	-1	CBA	-1	0	1
Female15	CBA	-1	0	1	BCA	-1	1	0	ABC	1	0	-1	CBA	-1	0	1	CBA	-1	0	1
Total		-32	9	23		-40	12	28		-18	10	8		-26	21	5		-28	1	27

Appendix E: Rounded Values used in Examples 1 & 2

	General Setup			Game Mode			Co-Op			Non-Co-Op			GP Rel.			Aesthetic		
Motivations	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Advancement	-0.33	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.66	-0.66	0.33	0.66
Mechanics	-0.66	0.00	0.33	-0.33	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.66	-0.66	0.33	0.66
Competition	-0.33	0.00	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.66
Socializing	-0.66	0.00	0.66	-0.33	0.00	0.33	-0.33	0.33	0.00	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33
Relationship	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.00	-0.66	0.33	0.33	-0.89	0.00	0.66	-1.00	0.33	0.66
Teamwork	-0.33	0.33	0.00	-0.33	0.33	0.00	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33
Discovery	-0.66	0.00	0.66	-0.66	0.00	0.66	-0.66	0.33	0.33	-1.00	0.00	1.00	-1.00	0.00	1.00	-1.00	0.00	1.00
Role-Playing	-1.00	0.00	1.00	-1.00	0.00	1.00	-0.66	0.66	0.00	-0.66	0.00	0.66	-1.00	0.00	1.00	-1.00	0.00	1.00
Customize	-0.33	0.00	0.33	-0.66	0.33	0.33	-0.33	0.33	0.00	-0.66	0.33	0.33	-1.00	0.00	0.66	-1.00	0.00	1.00
Escapism	-0.33	0.00	0.33	-0.66	0.33	0.33	-0.33	0.33	0.00	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.00	0.66

	Width			Ending			Entity Amount			Effects on E.			Actions per Entity			AI			UI		
Motivations	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Advancement	0.66	0.00	-0.33	-0.66	0.33	0.33	-0.33	0.33	0.33	-0.66	0.66	0.00	-1.00	0.33	0.66	-0.66	0.00	0.66	-0.66	0.33	0.33
Mechanics	0.66	0.00	-0.66	-0.66	0.33	0.33	-0.66	0.00	0.33	-1.00	0.33	0.33	-1.00	0.33	0.66	-1.00	0.00	0.66	-0.66	0.33	0.66
Competition	0.66	0.00	-0.66	-0.66	0.33	0.33	-0.33	0.33	0.33	-0.66	0.66	0.00	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33
Socializing	1.00	0.00	-0.66	-0.66	0.33	0.33	-1.00	0.00	1.00	-1.00	0.66	0.33	-0.66	0.33	0.33	-0.66	0.33	0.33	-1.00	0.33	0.66
Relationship	0.66	0.00	-0.66	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.66	0.00	-0.66	0.33	0.33	-1.00	0.33	0.66	-1.00	0.33	0.66
Teamwork	1.00	0.00	-0.66	-0.33	0.33	0.33	-0.33	0.00	0.33	-0.66	0.66	0.00	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.33
Discovery	0.66	0.00	-0.66	0.00	0.00	0.00	-0.33	0.00	0.33	-0.66	0.33	0.33	-1.00	0.33	0.66	-1.00	0.00	1.00	-0.66	0.00	0.66
Role-Playing	1.00	-0.67	-0.33	-0.66	0.33	0.33	-1.00	0.00	1.00	-1.00	0.33	0.66	-1.00	0.00	1.00	-1.00	0.00	1.00	-1.00	0.66	0.33
Customize	0.66	0.00	-0.66	-0.66	0.00	0.33	-0.66	0.00	0.33	-0.66	0.33	0.33	-1.00	0.33	0.33	-1.00	0.33	0.66	-0.66	0.00	0.66
Escapism	0.66	0.00	-0.66	-0.66	0.33	0.33	-0.33	0.00	0.33	-1.00	0.66	0.33	-1.00	0.33	0.66	-0.66	0.33	0.33	-0.66	0.33	0.33

	PC/NPC			Environment			Necessity of Org.			Game Supp Org			Comm Venues			Totals		
Motivations	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Advancement	-0.66	0.33	0.66	-1.00	0.33	0.66	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.33
Mechanics	-1.00	0.00	0.66	-0.66	0.33	0.66	-0.66	0.33	0.66	-0.66	0.33	0.33	-1.00	0.00	1.00	-0.66	0.33	0.33
Competition	-0.66	0.33	0.66	-1.00	0.33	0.66	-0.66	0.33	0.33	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.33
Socializing	-0.66	0.00	0.66	-1.00	0.33	0.66	-0.66	0.00	0.66	-0.66	0.66	0.00	-1.00	0.00	1.00	-0.66	0.33	0.33
Relationship	-0.66	0.00	0.66	-1.00	0.33	0.33	-0.33	0.33	0.33	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.33
Teamwork	-0.66	0.33	0.33	-0.66	0.33	0.66	-0.66	0.00	0.66	-0.66	0.33	0.00	-0.66	0.00	0.66	-0.66	0.33	0.33
Discovery	-1.00	0.00	1.00	-1.00	0.33	0.66	-0.33	0.33	0.00	-1.00	0.33	0.66	-1.00	0.00	1.00	-0.66	0.00	0.66
Role-Playing	-1.00	0.00	1.00	-1.00	0.00	1.00	-1.00	0.33	0.66	-1.00	0.66	0.33	-1.00	0.00	1.00	-0.66	0.00	0.66
Customize	-0.66	0.00	0.66	-0.66	0.33	0.33	-0.33	0.33	0.00	-0.66	0.33	0.00	-0.66	0.00	0.66	-0.66	0.33	0.33
Escapism	-0.66	0.33	0.66	-0.66	0.33	0.33	-0.33	0.33	0.00	-0.66	0.33	0.33	-0.66	0.00	0.66	-0.66	0.33	0.33

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